

# RAILROAD GAZETTE

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## EDITORIAL ANNOUNCEMENTS.

**THE BRITISH AND EASTERN CONTINENTS** edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It contains selected reading pages from the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.

**CONTRIBUTIONS.**—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

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FRIDAY, APRIL 10, 1908.

We print in another column a full abstract of the address recently delivered by Arthur Hale to a committee of the Massachusetts legislature opposing a reciprocal demurrage bill. Mr. Hale is always worth listening to, and when he talks about car service he has a way of expressing rather more clearly than anybody else a lot of principles that the average operating man understands but has never really thought out or formulated in his own mind, and that the average state legislator does not understand at all. What Mr. Hale had to say, reduced to its shortest and most impolite terms, was that reciprocal demurrage is not reciprocal, that it is an unfair and unwise principle and that New England has too many detention privileges already; but he put these plain truths in so amiable and convincing a fashion that it must have dispelled any illusions that existed in the minds of his hearers about this rather illusive subject. We are printing a good deal of Mr. Hale's address because we want it to be read in states that need it even more than Massachusetts does.

Although the electric motor is the ideal means for moving draw spans which must be turned by power, an examination of existing practice indicates that its adaptation to the work has not been well understood in the past. For example, a 250-ft. double track swing span weighing 600 tons is equipped with two 50-h.p. railway type motors. The maximum effort required of these motors, according to the ammeter readings, is about 45 h.p. In another case a 350-ft. double track swing span having twice the weight of the first, or 1,200 tons, is to be equipped with two 25-h.p. motors. A third case, a proposed 480-ft. double track span of 1,800 tons, is to have two 40-h.p. motors—three times the weight with four-fifths the power of the first. In the first instance the power provided obviously is excessive. What of the other two, which agree pretty closely? The greatest resistance to overcome in such service is the inertia of the span. Some recent experiments have shown that when the average angular velocity is approximately 1 deg. per second, about 80 per cent. of the effort of the motor is used in accelerating the motion of the span. This requires a large torque at starting and a uniform accelerating effort, conditions that are best met by the characteristics of the direct current series motor. In determining the design and capacity of the motor both the character of service and the maximum requirements are governing conditions, and it is here that advantage may be taken of a peculiar quality in electric motors to

secure the most economical installation possible. An electric motor properly designed is capable of sustaining a considerable overload for a short period of time without injurious heating. Therefore where a motor is loaded intermittently and for short periods, with intervals of rest between, it can be made to do work considerably in excess of its normal rated capacity. Furthermore, it may be specially designed for this intermittent loading and therefore be even better adapted to the work than a motor designed for continuous duty. The duty of a drawbridge motor is unique in that the working period covers only a few seconds of time and the cycles of operations may be separated by long periods of rest. For illustration, take the 250-ft., 600-ton span mentioned above. Assume it must be turned 90 deg. in 60 seconds. The demand on the motor is for 45 h.p., increasing from zero to a maximum at the end of 40 sec., say. Assume a rest period of 15 min. At 500 volts the maximum current used is 67 amperes. It can be shown that the equivalent heating effect of this current applied for 40 sec., followed by a period of rest of 900 sec., would be produced by a current of 14 amps., or about 10 h.p. at 500 volts, if continuously applied. Obviously, therefore, even one motor having a continuous capacity of 45 h.p. is too large for the service. What is required is a motor rated on its intermittent capacity of the full horse-power at full voltage for such a length of time as will produce the requisite temperature rise in service.

The "Bureau for the Safe Transportation of Explosives and Other Dangerous Articles" has been in operation since June 10, 1907. The report of Major B. W. Dunn of the United States Army who is Chief Inspector, covering the work of the Bureau up to February 1, 1908, is summarized in another column. This association is a splendid example of the way in which necessary and important results, which it has been proved by bitter experience it would be impossible to get by individual initiative, can be successfully brought about by intelligent co-operation. After the disastrous wreck in 1905 on the Pennsylvania Railroad near Harrisburg, Pa., caused by the explosion of a freight car loaded with high explosives, the Pennsylvania tried for two years through its own special inspectors to secure conformity to the revised rules of the American Railway Association for the transportation of explosives which had been amended as a result of this disaster. This company was successful in carrying out these regulations on its own lines; nevertheless only a small pro-

portion of the dangers from explosives were guarded against, because this one railroad company was powerless to enforce these regulations on connecting lines from which dangerous cars were constantly being received. President McCrea, of the Pennsylvania, was the leading spirit in the formation of the Bureau of Explosives, being chairman of the committee which drew up its constitution and by-laws. The bureau includes such members of the American Railway Association as choose to become members. Expenses are proportioned according to: (a) mileage; (b) gross earnings; (c) number of factories on each line where explosives are made. Its regulations for transportation of explosives were published in the *Railroad Gazette* of November 8, 1907. There are at present 94 railroad companies operating 149,669 miles of railroad which are members. The Baltimore & Ohio, the Chicago, Milwaukee & St. Paul, the Great Northern and the Northern Pacific are large roads which have not yet joined the Bureau. This mileage of nearly 150,000 miles is distributed among 17 local inspectors whose mileage runs from the 4,000 miles in the Indianapolis district to the 23,000 miles in the Kansas City district. The most striking results of the inspections can be summed up in three items from the summary: During the less than eight months covered by the report, the inspectors found 119 magazines with dirty floors stained with nitro-glycerine and 59 magazines with high explosives stored in them in a leaking and dangerous condition. Out of 178 cars inspected in transit or at terminals, the lading in 99 had moved because of improper loading or staying or other conditions such as would easily bring about a dangerous accident. One of these cars, which had cracks in the roof, sides and ends, contained over two tons of dynamite. Light material had been used to brace these packages and the bracing had given way, allowing the packages to slide about the car. As if this were not enough, loose iron pipe and a roll of wire cable in an upright position were loaded in the same car. The car was placarded for explosives on one side only. Here were conditions ripe for a terrible and costly accident. Based on experiences such as these, the fact that in spite of all that has been accomplished only 41 of the 94 railroads which are members of the Bureau had on February 1, received either a "first general inspection" or a "partial inspection," and the further fact that the Bureau is about to issue regulations for transportation of inflammables whose traffic volume is many times that of explosives, Major Dunn makes a strong plea for more inspectors. In his words, "the Bureau has undertaken a work of unsuspected magnitude." Great good has already been accomplished, actually and potentially. The Bureau must either go forward or backward; at the present stage of its development it cannot stand still. More funds are necessary if it is to do its now evident duty. The present is, of course, a difficult time to secure larger appropriations from railroads, but Major Dunn points out that the total of the known losses from the six major accidents from explosives and one large fire from a shipment of inflammable liquid, shown in the records of the Bureau for 1907, was over \$500,000 and even this does not represent by any means the total loss. If such losses are to be prevented in future the Bureau must be upheld in its work.

#### THE REASON FOR THE STEEL WHEEL.

It is a peculiarity of American railroad rolling stock that there is a roughness of finish and a crudeness of connection, not only between stationary parts, but also between parts that have some motion, the one over the other, that is not to be found in cars built in other countries. The reason for this is not hard to find. America was a great, undeveloped, sparsely settled country and the railroad, as a rapid means of intercommunication, was an absolute necessity for the upbuilding of the nation. In order to meet this demand, construction was carried on with great rapidity and pushed through territory where the immediate traffic in sight was very meagre. Consequently the first cost of roadbed and equipment was cut down to the lowest notch that made operation a possibility and so cast iron was substituted for forgings and rough metal for finished parts. Therefore, while the foreign car builder turned to wrought iron for the centers and early tires of his wheels, the American, being in possession of a very superior grade of cast iron that was not only exceedingly strong, but capable of being chilled to great hardness in the mould, used that metal for his wheels with great success under both passenger and freight cars.

Throughout all the middle years of the nineteenth century, cast iron was the only metal used for car wheels in the United States, and during the whole of this period makers were constantly experi-

menting with mixtures of metals and forms of patterns in order to produce a wheel that would possess some quality that would make it superior to its rivals. The records of the patent office are replete with the work of the designers in this direction. The result of this concentration of energy was the production of a wheel that took a high rank in the records of the time for durability and safety and was known as the charcoal iron wheel. Such a wheel was usually formed of about 85 per cent. of charcoal iron pig and 15 per cent. of the scrap iron resulting from this mixture, melted with the old companies' Lehigh coal, and was possessed of a chilled tread of great hardness and durability.

Meanwhile there had been no uniformity of practice in the form of the tread and flange, and other parts of the wheel. Each maker or purchaser had been a law unto himself, with the result that great variations of practice existed in different sections of the country and upon different roads in all of the details of wheel construction. Under the conditions existing at the time, this was a matter of comparatively small importance. The individual railroads were almost isolated, there was a diversity of gages, and interchange of traffic was so small that it was not until after the organization of the Master Car Builders' Association that any systematic effort was made to introduce a uniformity of practice into car wheel construction.

That association originated in a meeting of master car builders brought together to consider the conditions set up by the running of line cars over their respective roads and the rules under which such an interchange of traffic should be carried on. It was quite natural then that the wheel should be among those details that should receive early attention. It was necessary that it should run over tracks that differed slightly in gage; that were laid with rails of widely different pattern, with still wider variation in the methods of track laying and permanent way construction. It was necessary that the tread and flange of the wheel should be so proportioned that it could run over these different conditions of track with ease and safety, and further that the wheel should be of such diameter that the height of the cars and their couplers might be brought approximately to a uniform distance above the rail, a condition that was not realized, however, until many years afterwards.

At the meeting of 1868 an agreement was reached, regarding the width of the compromise tread, and thereafter there was considerable private discussion as to the desirability of a standard tread and flange, but it was not until 1882 that the subject was really brought before the association for action. At that time an agreement was reached regarding the width over all, as well as the diameter and the machinery was set to work to secure a standard form. The next year forms for tread and flange were proposed and these were almost identical with those that were afterwards adopted. In 1884 M. N. Forney read an elaborate paper on the relation of the wheel to the rail, and at the next convention in 1885, a contour was submitted for adoption as a standard, but was rejected as that of 1883 had been. In 1886 another form was submitted in which the tread was made slightly conical instead of cylindrical as in the case of the one presented in 1885, and this was adopted as a standard and has remained such until the present time.

In 1906, it was modified and the modification adopted as recommended practice by the addition of  $\frac{1}{8}$  in. to the thickness of the flange and the changing the taper of the tread from one in twenty-five to one in twenty. It is not probable that any further changes will be made for many years to come other than the abandonment of the old standard and the adoption of the recommended practice of 1906 in its stead.

Turning now to the character of wheels used during these early years we find that, as soon as the weights of passenger cars were increased above those obtaining in the late sixties and early seventies, due to the introduction of sleeping and parlor cars, managers felt a doubt as to the safety of the cast iron wheel for passenger service and the steel-tired wheel was introduced; slowly at first, but later it came into universal use except on a few roads with facilities for making their own wheels, so that they were put in a position of absolute control over methods and materials used.

At first the construction of the steel-tired wheel was somewhat complicated and involved the use of a large number of pieces. This was afterwards simplified to a great extent, and the parts made less. Meanwhile, when the first steel-tired wheels were placed in passenger service the standard capacity of the freight car of the country was 20,000 lbs. with the empty car weighing about as much more. In the later seventies there was a movement to increase the carrying capacity of these cars and in the succeeding fifteen years it rose to 60,000 lbs. Up to this time there had been no trouble with the



cast iron wheel and no change had been made other than to increase the thickness of metal in the plates and hub to meet the requirements set up by the heavier load that was to be carried and the larger axle that was to be used. This heavier wheel apparently fully satisfied the requirements of the 60,000 lbs. capacity car, though there were some complaints of the inferiority of the later day wheel as compared with those of twenty-five years before. Whether the wheel was actually inferior or was as good and simply failed oftener because it did not have the same margin of strength as the older wheel is an open question.

Later when car capacities were raised to 80,000 lbs. there was no appreciable shortening of the average car wheel life as compared with those under cars 60,000 lbs. capacity. But when in the late nineties the cars of 100,000 lbs. capacity were introduced a new element was brought into play. Roads equipped with such cars began to have a great deal of trouble with broken flanges.

On level roads the wheels are apparently able to give better service, but on mountain lines where there are long continued applications of the brakes, overheating, checking and subsequent breakage are of common occurrence while the average life of wheels under these high capacity cars is approximately one-half that under cars of 60,000 lbs. capacity. Frequently the heating of the wheel by the brakeshoe sets up such internal strains that a crack will start in the body of the metal where no possible inspection could detect it and then it works outward until, when it reaches the surface, it has developed to such dimensions that the flange breaks without warning with results that are more or less disastrous.

Facing this condition, with doubts, on one hand, about the entire reliability of the cast iron wheel, and with the excessive cost of the built-up steel-tired wheel, on the other hand, rendering these wheels out of the question for freight work, a market has been opened for a cheaper steel wheel than any that has been upon the market.

But the service that has been required and rendered by the steel-tired wheel in passenger car and locomotive work has established a high standard of efficiency, and it is essential that any innovation in the methods of steel car wheel construction and design shall produce a wheel that, so far as the physical properties of the metal composing it are concerned, shall be fully up to the standards already set by the steel-tired wheel. Its chemical composition must be such that its hardness, ultimate strength, elasticity, and wearing qualities should stand in favorable comparison with the best, and this must be done at a price that will make it possible to use such a wheel in freight service at a cost not to exceed the cast iron wheel. This does not mean that the first cost is to be the same, but that, when the renewals are taken into consideration, the ultimate cost of wheels for a series of years shall be no greater with the steel than with the cast iron wheel.

### THE PASSENGER AS A REFORM AGENT.

In a city not hundreds of miles from New York situated on a great railroad system there lived a "club man" who on his journeys to and from the metropolis often indulged in the luxury of a parlor or sleeping car. One day not long ago when starting on a long trip and seeking sleeping car accommodation he was, as he asserted, "held up" by the conductor of the car to the amount of \$1 as a bit of personal "graft," in addition to the regular charge for the berth. On his return the passenger entered no formal complaint but made club land resound with his wrong. He had been robbed by a highwayman in the railroad company's uniform. The railroad company was not much better when it winked at such graft—and so forth and so on in the familiar terms of epithet of the angered and aggrieved passenger. The complainant, in one of his bursts of eloquence against the railroad, chanced to be overheard by one of the company's officers. The officer quietly started a careful investigation which in effect confirmed the dollar story and then called on the complainant to stand to his guns in a formal statement as basis for discipline of the offending conductor. Then the passenger backed water. He was one of the familiar type of men who are louder in talk than agile in action and who shirk even small responsibility. He refused to make formal complaint and declared that the dollar was but a gratuity pure and simple. And so the inquiry of the company with the improvement of the service as its aim came to naught.

A few weeks ago on one of the branch lines of the same railroad system another passenger was riding in the smoker on a special excursion ticket good on its face for that particular train. In insolent terms he was ordered back by the regular train con-

ductor to three extra rear cars put on for excursionists. The passenger refused to go, showed the face of his ticket and stood successfully on his rights. Fifteen minutes later on asking an apology from the conductor he was refused. A week or two after, the same passenger, who was a lover of fishing, after a day's sport, cumbered with much angling *impedimenta*, reached a flag station of the same company after a toilsome pull at the oars and a hard trudge by highway. The train schedule called for a stop at the station and, by custom for years in the absence of the regular "drop" the stop signal was the waiting passenger on the platform, visible from far down the line. Here the waiting angler stood with two fish baskets, three bait pails and the same number of fishing rods like an animated semaphore. The engineer, afterwards alleging that he "didn't see," ignored the passenger and ran the train by and on. The train happened to be fifteen minutes late.

The outcome in these two cases was far different from the first. The aggrieved passenger followed up instantly each offense with a formal statement to the division superintendent. There was some delay—partly accidental—and cutting of red tape. But, in the end, after a fair investigation the conductor was summoned before the powers, found guilty, warned to exercise better courtesy and judgment and ordered to make apology to the passenger; and, in the case of the engineer, the result was substantially the same. A fair inference based on the rule of human motive and conduct justifies the conclusion that the conductor will hereafter be more heedful of duty and, what is of more importance, will spread his disciplinary experience among his mates to their own and the company's profit; that the engineer will not again run a belated train past a flag station in violation of the schedule; and that, in the earlier instance, the sleeping car conductor will be encouraged to continue his "graft." Incidentally it may be stated that the passenger who complained received official thanks.

These three cases are not fiction or parable. They are actual and recent instances which illustrate an evil and its remedy. Every railroad corporation, if wise, wants good service. It realizes or should realize that its chief point of contact with the public is in that service. It wants to subdue petty graft, to supply good cars, accurate train service, tactful and judicious conductors and faithful engineers and trainmen. Elements such as these are a part, and a large part, of the company's assets that connote public good will and reach up even to legislation. But a railroad corporation is not an Argus. It owns no accurate personal equation of its thousands of officials; and, in the detection of grievance, it must rely on the passenger's moral sense and individual backbone, its own responsibility ending when it offers the mechanism of prompt inquiry and correction. But it is against just such a condition that the average passenger fails to make good. He voices his wrong, real or imaginary, in private outcry, in an anonymous screed to a local newspaper or in "setting up" a sensational reporter with his tale. In not a few cases he swallows the offense in silence and says and does nothing. In his relation to the railroad company he belongs to that large group of citizens who in civic life are neglectful of duties and who would rather have things pleasant than have them right. When the railroad passenger reverses that too common viewpoint, drives his complaint home, reserves his outcry for the time when actual grievance is officially unredressed and recognizes his own *quasi* partnership with the railroad in improved service, then will the evil be minimized and the passenger himself become the advance agent of its reform.

### NEW PUBLICATIONS.

*Intercompany Relationships of Railways in the United States*, as of June 30, 1906. Prepared by the Division of Statistics and Accounts, Interstate Commerce Commission, Washington, D. C.

The Interstate Commerce Commission has issued its first special report under the amended Interstate Commerce Act. The report covers investigations intended to show the manner in which the railroad corporations have been welded into highly centralized systems, and to present a statement of net railroad capital outstanding in the hands of the public, eliminating all holdings of railroad securities by other railroad corporations. The statistical portion of the report is now in press; the portion at hand is the text only, but it shows, according to the Commission's calculations, that the net railroad securities of the country are on a basis of \$58,050 per mile of line. This figure, which is of considerable statistical interest, is the only useful result which appears to have been accomplished by the very great amount of work which must have been spent upon the study. The report is illustrated with a number of diagrams showing the

way the more complicated railroad systems have been formed together through the medium of holding companies. Although these diagrams are interesting, it is scarcely clear why the Interstate Commerce Commission should have spent time on them, as the subject matter is all of public record and easily obtained by those who are interested. The principal impression which the reader gains from the advance copy is a feeling of sympathy for the railroads, which had to answer the exceedingly complicated questions addressed to them by the Commission in a series of circulars in order to enable the Commission to bring out a number of well-known facts from original sources.

## CONTRIBUTIONS

### The Inland Waterways Commission and Transportation.

New York, March 23, 1908.

TO THE EDITOR OF THE RAILROAD GAZETTE:

For years the inhabitants of the Mississippi Valley have asked for such improvements of that stream and its affluents as would abridge either or both, the cost in time and money necessary for assembling and distributing commodities produced, consumed or transported for further increase of value in and about that basin. They labored under the impression that their efforts were impeded or nullified by the able chairman of the House River and Harbor Committee, and that the principle of proclaiming an unincreasable minimum and thus pitting locality against locality, popularly called log rolling, was being used with ability to continue the poverty of localities deficiently supplied with transportation facilities. This feeling led to action which is shown in the commencing sentence of our President's letter of March 14, 1907: "Numerous commercial organizations of the Mississippi valley have presented petitions asking that I appoint a commission to prepare and report a comprehensive plan for the improvement and control of the river systems of the United States. I have decided to comply with these requests by appointing an Inland Waterways Commission."

There follows this the names of his appointees, nine gentlemen, of whom Congressman Burton, chairman of the River and Harbor Committee of the House of Representatives, was at the President's suggestion made chairman of the committee, and by election of the committee Senator Newlands, of Nevada, is vice-chairman, and Dr. McGee, of the Bureau of Soils, is secretary. President Roosevelt seems to have handed those petitioners of the Mississippi valley, who desired cheaper transportation, a lemon. This vulgar and upstart word is used advisably. The classic "Dead Sea apple" has by reputation an inviting exterior. The report contemplates only inaction and delay. The committee contains no expert on transportation. Only one, General Mackenzie, apparently at all connected with transportation, and he, as chief of the United States Engineer Corps, dissents from his colleagues in three out of six items of a "Supplementary Report."

The chairman of the Commission has been highly and continuously praised for his services to the country in connection with River and Harbor bills by all "accelerators of public opinion" owned or employed by our railroad bankers. These services have been generally obstructive. The probable value of contributions to the science of transportation by the Secretary of the Commission may be judged by an extract from his speech at the "Atlantic Deeper Waterways Conference," Philadelphia, November 18-20, 1907. In this, after referring to the pre-revolutionary tax on tea (which Lord Acton said broke up the British Empire) he continued: "We are paying to our tyrant transportation a tax of 30 to 50 per cent. on all that we eat, wear or use in our every day lives. Our forefathers rebelled—why shouldn't we?" All this of the lowest freight rates in the world; substantially one-half those of Holland and Belgium, one-third those of Great Britain.

Vice-Chairman Newlands, at the same conference, referred to "men in our great financial centers who have been accustomed to gather together these fragmented railroads, form them into great combinations, and then force upon the country exaggerated volumes of bonds, preferred stock and common stock that bewilder the imagination." Those who traveled between Buffalo and New York, with four changes of trains to Albany and then ferried at that city, before Corning gathered together the fragmental railroads which he combined into the New York Central, will not particularly regret the combination. Nor will there be regret at the marked decrease in freight rates shortly following the consolidation. The Senator's idea of bonds, preferred stock and common stock being forced upon the country will perhaps not be concurred in by those who have worked early and late to obtain an infinitesimal percentage of the Senator's exaggerated volume. No recommendations of any potentiality in reducing the cost of transportation seem possible from a committee so officered.

President Roosevelt, however, basing his efforts on "the general and admitted inability of the railroads to handle promptly the traffic of the country," rather than on the economic value of capacious

channels of exchange, the use of which cannot, without legislative action, be impeded by or to any one, endorses his appointees and their report in a message of transmission, Senate Doc. 325, as follows:

"This report is well worth your attention. It is thorough, conservative, sane and just. It represents the mature judgment of a body of men exceptionally qualified, by personal experience and knowledge of conditions throughout the United States, to understand and discuss the great problem of how best to use our waterways in the interest of all the people. If the report errs at all it is by over-conservatism."

Everyone has read, "that it was unregulated railroad competition which prevented or destroyed the development of commerce on our inland waterways." And there are traces on the public mind of a latent regret that the railroads could not have been so regulated as to make their freight rates as high as in Germany and so conserve the navigation of inadequate waterways. In the report prominence is given to Representative Burton's patent, which is "heartily" endorsed in the message, for impeding internal improvements by demanding an "equitable distribution" of their costs to the communities, etc., "beneficially affected." That is to say, e.g., we should have postponed building the Union Pacific Railroad until the Mormons (who, by the way, would have been starving before three years without it) could have contributed equitably to its cost. There may be some more ingenious way of continuing the poverty of localities whose principal products cannot bear the costs of production and transportation to market.

Through the report and not absent from the message, is evident a desire to build up another department of persons drawing pay from the public purse and dependent on executive favor. The asked for regulating power of this department might, in impure hands, become particularly valuable before elections. Closely connected with the above mentioned object seems to be a desire to build up a combination or trust between railroads and water carriers, as evidenced by such phrases as: "With a view to equitable co-operation between waterway and railroad facilities for the promotion of commerce and the benefit of the people," "devising means of rendering the two systems complimentary and harmonious and making such fair division of traffic that rates and management may be co-ordinated economically and with benefit to this country." It is to be hoped that neither an additional "administrative agency with large powers," nor a control of rail and water transportation which might render a farmer taking a sack of corn into his dug-out for transportation, liable to fine by some future Table Mountain will commend itself to the country.

Noticeably the report is without consideration of the effect of depth on the cost of transportation by water. "Co-ordination" with the railroads seems hardly second to the desire for large powers for the agency. To be sure, the President speaks enthusiastically for deep channels. But those who remember his decision in favor of a barge canal to handle the traffic of the Lakes will doubt the adequacy of his conception of depth. Under that decision, by the then Governor of this state, we are in the course of expending \$101,000,000 on a canal so shallow and inadequate that on its completion it will probably not bring to the city of New York 5 per cent. of the 70,000,000 tons of freight now passing Detroit; two-thirds of which is said to be on its way to an increase of value by manufacture. Its only value will lie in its ability to keep lake vessels from competing for freight with the vessels already on the Atlantic, and the people at the head of Lake Michigan who think they are going to get their vessels out by way of the Mississippi must be resigned to waiting.

Notice also seems desirable of the fact that both the message and the report are surcharged with references to monopoly which seem intended to develop a spirit of national antagonism rather than of mutual helpfulness and to decrease commercial confidence in the future. Some 16 years ago the country was filled with the cries of calamity howlers, whose terminology was mostly drawn from tons of literature sent west from this city. This literature was on like lines of passification and progress as those inculcated in the document under consideration. The howlers, it will be remembered, got their calamity.

The influences on the prosperity of the country which would follow ignoring depth and capacity in improving waterways, and adopting the above mentioned plans of control and trust development are liable to be very serious. Senator Newlands' "co-ordinated" trusts will most surely result in lower prices for farm products and raw materials at points of production, and higher costs at points of consumption. No politically appointed commission can be expected to manage transportation as economically as those educated to the business and whose future is dependent on success. And as those who direct clamor against "monopoly" are, in fact, still more insistent against "ruinous competition," we may expect under their administration an orthodox and uniform system of railroading that will kill initiative and invention; which will imperatively demand higher rates, which higher rates will not bring increased profits to transporters.

Heretofore, with the highest wages paid in the world and with



money and materials generally dearer than elsewhere, our railroads free to charge what the traffic would bear, to build into others' territory and to wage ruinous rate wars, have steadily reduced the cost of freightage until they have presented the people of this country with an unprecedented and unascertainable beneficence; unascertainable because with the high freight rates of Europe much of our merchandise could not have stood the cost of production and transportation. The wealth accompanying its production and the decreased cost to consumers from its abundance would have been lost to the country by European freight rates. Our phenomenally low freight rates on the lakes and the influence they have on production is admitted by all. There is a lack of reliable statistics as to our coastwise commerce, but experts assert that no other country has as cheap coastwise carriage as this. All these great traffics until lately have been free of control. Since our state and national governments have assumed and extended their control railroad freights have risen notably. Lake and coastwise freights, less controlled, have not.

One of our great sources of prosperity, if not the greatest, since about 1870, when our average freight rates were reduced below those of England, has been the advantage we have had over competing countries in the cost of assembling the raw materials for manufacture and distributing the finished product. Senate Doc. 325 seems to promise no further reduction in the cost of such service. All who wish the continued advance of this country and understand the function of transportation should examine the document with care.

EDWARD P. NORTH, C.E.

#### Automatic Inspection of Car Wheels in Service.

Sacramento, Cal., March 16, 1908.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The inspection of car wheels in service for defects that may lead to failure is an interesting and exceedingly important part of railroad work. On the thoroughness with which the inspection is made depends in considerable part the measure of safety guaranteed every train on leaving an inspection point, and many readers of the *Railroad Gazette* may take at least a passing interest in anything proposed as an improvement in this field.

As every railroad man knows, there are car repairers and inspectors stationed at terminals and also usually at two or three other points on a division, and one of the duties of these men is to allow no pair of wheels to pass that is defective. They are expected to examine every wheel carefully all the way around—plates, flange and tread, and on every flange that appears to the eye at any point to be worn nearly to the limit of vertical wear or thickness they are to try their gage to ascertain if it should be allowed to pass; on flat spots, shelled-out spots and chipped rim, the gage should be tried to see if these defects exceed in extent the limit allowed. Any wheel that has been pressed too loosely on the axle and has shifted place under pressure brought to bear in passing curves and frogs, should be discovered in the inspection as the defect is most dangerous. The difficulties of such a thorough inspection are obvious. The time allowed is often short; inspections must sometimes be made at night and in storms; the wheels are under the cars, partially hidden by brakes, boxes, frames and bolsters, and thorough inspection is at best difficult and often impossible, making the temptation great for an inspector to chance that all is right on a wheel, a truck, a car or even an entire train.

The application of gages for the defects described takes time, and the particular part of a wheel on which it is desired to try a gage may be hard to get at. For example, suppose there was in a freight train of say 40 cars, one pair of wheels that were out of gage, due to a wheel slipping on the axle or other cause. To locate this pair might require the gaging of most of the pairs of wheels in the train—a good sized task. If it was not known that the defective pair was in the train, the chances are great that with the ordinary methods of inspection it would not be discovered; yet to leave it undiscovered courts disaster.

It has occurred to me that it is possible to place in the track at terminals or inspection points, on the incoming track or on a siding in connection with it, an automatic means of applying the gages to the wheels as they pass, and to register the condition of the wheels in such a manner that it may be seen at a glance if flanges are missing or worn to the limit of wear; whether all wheels are correct in gage, and even whether or not flat spots or shelled-out spots or chipped rims exceed in extent the limit allowed. In short, I want to apply the M. C. B. gage by mechanism instead of by hand, for detection and location of all the defects that require the application of the gage.

It may be objected that such a device would make car inspectors careless. It should not; they should be held responsible more than ever for cracked plates and other defects of wheels and running gear that do not require the application of a gage to determine their extent.

Under ordinary inspection, the rejection of a wheel for flange

worn to the limit of thickness or vertical wear by use of the hand gage is to a considerable extent a matter of the inspector's judgment. Flanges are seldom worn so that the gages apply either for thickness or vertical wear just as they are shown to do in the M. C. B. rules. A flange is worn thin, but the gage does not go down on the tread so as to exclude daylight under it at the center, as it is shown to do in the M. C. B. rules; a flange is worn vertically until considerably beyond the limit of safety, yet this wear is seldom absolutely vertical, and a question is raised in the inspector's mind whether or not the wheel should be condemned. An automatic machine for applying the gage would have a "personal" equation of its own, but one that should be more constant than that depending on the various judgments of several inspectors. Such a machine would require expert attention, but it would require many men to attain the efficiency of one machine in inspection for the defects referred to.

Freight cars, a large percentage of which are loaded at way stations, may for months at a time pass inspection points only in through trains; they are liable to pass these points in storms and at night, and even at best, with many trains of many cars each and the limited time available, thorough inspection is impossible. Repairers and inspectors are often called upon to repair some damage to some car in transit, and that, too, takes up the time that should be available for inspection.

Railroad authorities state that from 60 to 90 per cent. of all wheels removed are removed for worn flanges. Inspection would show that many of these are worn much beyond the limit, proving that many of them must pass inspectors time and again before they are discovered and removed. On every wheel removed, no doubt an inspector has tried his gage, perhaps a number of times. If this could be done automatically by machinery, in the aggregate it should represent a considerable saving of time, taking into account the fact that one thorough inspection by some device that would register several points of every wheel in the train without fail should be worth a dozen superficial inspections.

The idea is new and untried, and to develop an efficient machine for the purpose would require much experimenting, but with ultimate success it should result in saving to railroad companies the time required for thorough inspection for the defects referred to, and in saving to public and railroad alike some of the life and property now lost in wrecks.

CHAS. BROWNING, JR.,  
Office of Laboratory Foreman, Southern Pacific Co.

(Mr. Browning modestly omits to mention that he has himself taken out patents for such a device. We understand that no machine has been built, however.—EDITOR).

#### Locomotive Types and Weights.

Boston, Mass., March 30, 1908.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The first of the following tables is a compilation from the reports of the Interstate Commerce Commission from 1902 to 1906, both inclusive. It serves to show the tendencies of modern practice as to the use of locomotives of several of the most important classes. It is evident that the four-wheel switching engines are giving way to the six-wheel engines, which clearly constitute the accepted class. While a number of eight-wheel and ten-wheel switchers are used, the number is not large, nor the increase significant.

The most striking feature of the table is the increase in numbers in the Consolidation type, nearly double in four years. This appears clearly to be the accepted type for a large part of the freight service. The next most important feature is the steady falling off, since 1903, in the American type. This type is evidently yielding on one side to its modification, the Atlantic, for light, fast service, and on the other to the 10-wheel or the Pacific where heavier service is demanded. The Mogul and its modification, the Prairie, seem not to gain much in favor. The ten-wheel and the Pacific (its modified type) show a very material gain. The ten-wheel appears to be used both as a passenger type and as a freight type.

There has probably been a more or less complex change going on. In replacing an American, when worn out, the tendency for light fast service is towards the Atlantic; but in many cases a heavier engine takes its place, a ten-wheel or a Pacific. In the meantime a ten-wheel freight engine, when worn out, is probably replaced, in many cases, by a heavier Consolidation. So that while the American type is decreasing and the Consolidation is increasing, the six-driver types are both increasing and decreasing in numbers, but show a substantial net increase. The six-driver types, the ten-wheel, the Mogul, the Pacific and the Prairie, still outnumber the eight-driver types, the Consolidation, the Mastodon and the Mikado. It is no doubt the fact that the four-driver types still lead for passenger traffic, but it is losing ground steadily; for freight service the eight-driver types are far in the lead and are gaining rapidly; the six-driver types, divided between freight and passenger

service are still gaining substantially. The use of the trailing truck in the Atlantic, Columbia, Pacific, Prairie, Mikado and Santa Fe seems to meet with considerable favor.

The tractive force (depending on the loads on driving wheels) is still increasing notably; the average tractive force has increased as shown in Table II.

TABLE I.—Number of Engines, and Increase in Number.

Classes.	Arrangement.	1906.	1905.	1904.	1903.	1902.
Switching.*	OO	970	1,118	1,172	1,212	1,106
	—148	—54	—40	+106		
	OOO	5,858	5,165	4,796	4,222	3,683
	+693	+369	+574	+539		
	OOOO	171	149	168	166	115
	+22	—19	+2	+51		
American	OOOOO	19	14	10	9	7
	+5	+4	+1	+2		
	OOOOOO	1	1	0	0	0
	+0	+1	0	0		
Atlantic	OOOO	10,348	10,753	11,323	11,652	11,280
	—405	—570	—329	+372		
Columbia	OOOO	1,359	1,119	852	674	367
	+240	+267	+178	+307		
Ten-wheel	OOOO	98	57	121	36	17
	+41	—64	+85	+19		
Pacific	OOOO	9,855	9,396	9,232	8,702	7,605
	+459	+164	+530	+1,097		
Mogul	OOOO	521	323	186	38	3
	+198	+137	+148	+35		
Prairie	OOOO	5,539	5,482	5,465	5,247	4,871
	+57	+17	+218	+376		
Consolidation	OOOO	698	520	456	418	197
	+178	+64	+38	+221		
Mikado	OOOO	14,320	12,591	11,399	9,008	7,494
	+1,729	+1,192	+2,391	+1,514		
Mastodon	OOOO	178	122	34	34	2
	+56	+88	0	+32		
Decapod	OOOO	581	546	557	577	484
	+35	—11	—20	+93		
Santa Fe	OOOO	15	15	10	13	12
	0	+5	—3	+1		
Total (all classes)		50,954	47,696	46,743	43,871	41,225
		+3,258	+953	+2,872	+2,646	

\*Mainly.

TABLE II.—Average Tractive Force.

Class.	1902.	Tractive force 1906.	Per whl, 1906.
Six-wheel Switcher	20,300	23,400	3,900
American	13,900	14,700	3,700
Atlantic	21,800	23,400	5,800
Ten-wheel	21,400	22,800	3,800
Pacific	28,300	30,200	5,000
Mogul	21,200	22,600	4,300
Prairie	25,300	29,500	4,900
Consolidation	29,400	34,200	4,300
Mikado	21,500	43,900	5,500
Mastodon	33,500	33,400	4,200
Santa Fe		62,800	6,300

The figures seem to indicate that many old (and light) American, ten-wheel and Mogul engines are still kept in service. The newer types appear to be of more powerful build, as shown by the greater tractive force.

C. FRANK ALLEN.

#### Committee Work of the Maintenance of Way Association.

The Board of Directors of the American Railway Engineering and Maintenance of Way Association has issued instructions to the various committees concerning their work for the coming year, an outline of which is given below. The committees have been rearranged and are thought to be unusually strong and efficient. The Board has established November 30 as the limiting date for receipt of committee reports by the secretary. Reports received after that date will not be presented for final action at the following annual convention.

##### I—ROADWAY.

- (1) Continue the consideration of track elevation and depression inside of cities, and grade and curve improvement work outside of cities, and submit recommendations covering more particularly questions of detail relative to the handling of the work.
- (2) Report on the best method for determining the size of waterways.
- (3) Report on the protection of the roadbed in embankment and excavation from the action of water, more particularly with reference to protection from washouts or overflows and from slides, whether caused by surface or underground water.
- (4) Report on the surface and sub-surface drainage of embankments and excavations.
- (5) Report on the tiling of wet cuts and the curing of slides.

##### II—BALLASTING.

- (1) Review the customary recommended practice for preparation and delivery of various classes of ballast, with cost of handling same, if practicable.
- (2) Review the advantages and disadvantages of the various types of ballast, including stone of different kinds, slag and gravel,

and the different qualities of gravel with reference to the amount of sand or clay contained.

(3) Report on the best method to be used in determining the wearing quality of crushed stone.

(4) Review the customary practice and practicability of treating rock ballast which has become foul under the ties.

(5) Prepare recommended principles of practice for slag ballast, chats ballast, cementing gravel ballast and chert ballast.

(6) Report on the necessity for and best material for sub-ballast.

(7) Review of special literature on the subject of ballasting.

##### III—TIES.

(1) Continue the compilation of statistics upon the life of ties, both treated and untreated, and the causes of failure. Present summary compilation of reports received and draw such conclusions therefrom as the statistics warrant at the present time.

(2) Prepare critical review of the general question of the present and future status of the tie supply, the various methods heretofore adopted for reducing the yearly demands on the timber supply, and what general lines of investigation and change in existing methods may seem most desirable to be followed so as to secure the best results in the future.

(3) Collect statistics on the extent of the use and the life of metal or composite ties up to the present time, with illustrations and descriptions of the most successful designs, and draw such conclusions as the conditions may warrant.

##### IV—RAIL.

(1) Continue the investigation of the breakage and failure of rails and present summary of conclusions drawn from reports received.

(2) Report on the results obtained from the use of open hearth steel rails and the chemical composition of such rails.

(3) Report on any recommended changes in specifications for Bessemer steel rails as heretofore adopted by this association.

(4) Present recommendation as to standard rail sections.

(5) Present report showing diagrams or photographs of typical characteristic rail failures corresponding to the classification as given in form M. W. 1,200, Report of Rail Failures in Main Tracks.

##### V—TRACK.

(1) Review and revise the committee's report presented at the ninth annual convention, covering the following subjects:

(a) Report on the subject of turnouts and turnout material, including the best types of switchstands, switchpoints, frogs, guard rails and throat clearance, bearing in mind the possibility of an increase of the thickness of wheel flanges and the effect of worn ties and wheels upon the various parts of turnouts, frogs and crossings.

(b) Report on facing point switches for high speeds with a continuous main line rail.

(c) Confer with committee on signaling relative to switchstands.

(2) Continue investigations in connection with a sub-committee of the American Railway Master Mechanics' Association upon the subject of widening gage on curves and spacing of guard rails, as affected by the different lengths of engine wheel base, arrangement of flanged wheels and wheel wear.

(3) Report on whether wide gage which is due to worn rail should be corrected by closing in or replacing the rail.

(4) Report on the extent rail should be worn before it becomes unsafe.

(5) Consider revision of paragraph (3), under "Proper Method of Spiking," page 64, Manual of Recommended Practice, and report recommendation as to extent gage on curves should be worn open before closing in is necessary.

(6) Reconsider and report any recommended change in "Standard Drilling for Rails," as heretofore adopted by this association (Manual, 1907, p. 65).

##### VI—BUILDINGS.

(1) Reconsider amended conclusion No. 5, relative to locomotive coaling stations (Bulletin 95, pp. 69-70).

(2) Report on the use of reinforced concrete for coaling stations and storage bins.

(3) Collect data as to the actual use of reinforced concrete roofs for roundhouses, where located, life to date, results so far obtained, and critical analysis of advantages or possible defects; also diagrams of typical designs.

(4) Report on the best method for smoke removal, ventilation and heating of roundhouses.

(5) Report on the design and detail arrangement of oil houses at terminals.

##### VII—WOODEN BRIDGES AND TRETTLES.

(1) Continue the revision of the specifications for structural timbers, co-operating with Committee Q of the American Society for Testing Materials and other committees on the subject, with a view, if possible, of preparing a uniform standard specification.



- (2) Prepare a list of recommended safe unit stresses for structural timbers.
- (3) Revise the report on standard names for structural timbers.
- (4) Study the principles and methods of pile-driving, and collect data relating to the current practice.
- (5) Report on best method for classification of pine timber for structural purposes in place of classification by botanical names.

## VIII—MASONRY.

- (1) Reappoint a sub-committee to co-operate with the "joint committee" on Concrete and Reinforced Concrete.
- (2) Collect data on the reported failures of concrete structures and the probable cause of same.
- (3) Investigate and report upon the waterproofing of masonry, covering methods, results, cost and recommended practice.
- (4) Report on the use of reinforced concrete trestles, typical designs, cost and recommended practice.
- (5) Present typical plans of retaining walls and abutments, plain and reinforced, with comparison and recommended practice.
- (6) Report on the desirability of all monolithic construction in arches or large abutments with wing walls.
- (7) Submit specifications for reinforced concrete.

## IX—SIGNS, FENCES, CROSSINGS AND CATTLE-GUARDS.

- (1) Present such additional recommendations and conclusions covering the various subjects reported on in the previous reports of the committee as may be considered desirable.
- (2) Report on snow fences, snow sheds and other means to prevent snow accumulating and best methods of clearing tracks and snow removal.
- (3) Report on the use of concrete fenceposts, results obtained so far in actual service, designs and cost.

## X—SIGNALING AND INTERLOCKING.

- (1) Mechanical interlocking specifications.
- (2) Electric interlocking specifications.
- (3) Rubber-covered wire specifications.
- (4) Prepare standard contract for signaling work.
- (5) Prepare outline and description of a comprehensive system for universal signaling, suitable for general adoption.
- (6) Confer with committee on Track relative to switchstands.

## XI—RECORDS, REPORTS AND ACCOUNTS.

- (1) Revise "Track Chart," form M. W. 1,016, so that the chart will show the conventional signs as adopted by the association.
- (2) Recommend any desirable changes in conventional signs as heretofore adopted.
- (3) Review the subject of "Time Book" and recommendations as to revising form M. W. 1,008, with a view to preparing a form that may be uniformly used for all maintenance of way departments, and offering a check against irregular practices and allowing the use of a daily time report.
- (4) Recommend forms for use of maintenance of way departments for preparing preliminary detailed estimates of contemplated construction work, this form to be used preliminary to and form the basis for the summary estimate data embodied on form M. W. 1,017.
- (5) Prepare forms for collecting and analyzing rail statistics.

## XII—UNIFORM RULES, ORGANIZATION, TITLES, CODE, ETC.

- (1) Supplement "General Rules for Government of Employees of Maintenance of Way Department."
- (2) Prepare special rules for foremen and other employees, properly grouped and classified in accordance with and supplementary to the general rules heretofore adopted.

## XIII—WATER SERVICE.

- (1) Report on the use of coal and gasoline or other fuels as motive power for pumping plants, with relative economy and desirability of each system under different conditions.
- (2) Report on the general principles of the water supply service, independent of the question of water treatment, and on typical installations for various characteristic conditions.
- (3) Report on various types of track tanks, with designs of typical installations, and critical review.

## XIV—YARDS AND TERMINALS.

- (1) Report on the average and maximum classifying capacity of hump yards with one or two scales on the hump and the number of yard engines required under varying conditions.
- (2) Report on terminal freight houses at large terminals and transfer points, more particularly with reference to general arrangement of buildings and platforms and the track layout.
- (3) Development of mechanical handling as a means of promoting rapidity and economy in the handling of freight.
- (4) The relation of the percentage or proportion of cars to be weighed to the location of scales on the hump or elsewhere, and if not placed on the hump, where should scales be placed, and the reasons therefor; also how weighing is done where cuts of cars are switched.
- (5) Report on the feasibility of transferring freight by means of movable freight platforms, and outline of methods.

## XV—IRON AND STEEL STRUCTURES.

- (1) Continue investigations as to impact tests.
- (2) Continue investigations in regard to injury to bridges and railroad structures caused by flat spots on wheels, conferring with committees of other associations.
- (3) Report on the care of existing bridges, inspection, methods of field work and records of inspection.
- (4) Report on the maintenance of bridges, including protection of steel structures from corrosion.
- (5) Specifications for bridge erection.
- (6) Report to what extent steel bridge construction for the main girders of bridges carrying heavy loads under high speeds is preferable to reinforced concrete construction.

## XVI—ECONOMICS OF RAILROAD LOCATION.

- (1) Continue the consideration of all questions connected with railroad location, grades, lines and improvement of grades and lines affecting the economic operation with relation to traffic, tonnage ratings, speed, density of traffic and financial considerations, with the special aim in view of establishing uniform methods and unit values for investigating and analyzing the relative changes and costs of comparative routes or proposed grade reductions and line corrections.

## XVII—WOOD PRESERVATION.

The committee work is to cover in general the investigating and reporting on the preservation of wood used for ties and for railroad structures and buildings, confining the work of the committee more particularly to processes, methods and results obtained.

Present recommendation as to outline of work for the committee, with suggestion for classification to be followed.

Continue the work done heretofore by the committee on Ties and on Wooden Bridges and Trestles, relating to the special subjects of processes and methods of wood preservation.

## UNIFORM GENERAL CONTRACT FORM.

Prepare uniform general contract forms and present recommendations on the subject.

## Reciprocal Demurrage and Car Supply.\*

BY ARTHUR HALE.

This is the first winter that I can remember—and my recollection goes back at least twenty-five years in transportation matters—that there has not been a car shortage.

A car shortage is a usual, I might almost say a healthy, symptom in the winter, but this winter of 1907-8 is the first winter that we know of when there has been a car surplus. The situation of the country and of the railroads is pretty well described in a recent Bulletin of the Department of Commerce and Labor, indicating a falling off in many of the leading trades in percentages from 10 and 15, up to 50 per cent. in the iron trade. That falling off in business is reflected in the business of the railroads. The reports of the roads for December are all in, and of some of the roads for January, and almost without exception those reports are showing fearful losses in gross earnings, losses which vary all the way up to 50 per cent. Some of the Pittsburgh roads are only earning 50 per cent. of what they earned last year.

The situation, so far as it regards cars, is indicated in the bulletins of our committee, showing surplus cars in this country on February 19 amounting to 320,000. That is a slight improvement, I am glad to say, over February 5, when the surplus cars reached their high water mark, 343,000. And I am glad to say that the next bulletin, which covers the situation on March 4, shows another slight decrease, although the totals will be over 300,000.

I am sorry to say that the decrease in surplus is largely caused by an event which I consider calamitous—the probable shutting down of the coal mines in the Middle West. The railroads in and about Chicago have a very strong feeling that the coal industry will suspend on April 1, and for that reason they are loading up all of the coal cars they can get, and there is on some of the railroads, for the first time in several months, a shortage of coal cars shown. But the reason of that is that they have loaded up all the coal cars they could get, either with their own coal or with somebody else's coal, in anticipation of this stoppage of labor on April 1. I do not think it will be called a strike, I hope it will not extend to the East, but everyone in Chicago who is familiar with the coal trade seems quite sure that on April 1 the mines in Indiana and Illinois will shut down, and they are taking precautions.

These figures, which have recently (and very much to my surprise), attained public interest, are figures which our committee has been collecting for about a year. We were appointed about a year ago to look into this car shortage question, for nobody knew what the car shortage was for the whole country. Every railroad knew what its own car shortage was, but there was no central body which knew what the car shortage of the whole country was. Our first

\*Argument before the Railroad Committee of the Massachusetts State Legislature, March 11, 1908.

duty, therefore, was to find out what the car shortage was and where the car shortage was.

We, therefore, sent out circulars, but, in the first place, only to the larger railroads. We asked for their shortage, and we also asked for their surplus, although the request for the surplus was received with some derision by some of our friends. They said, "What are you asking for surpluses for? There aren't any surpluses and there never will be any surpluses." We got answers from about 61 of the leading railroads in January and in February, and in February on those railroads the shortage was over 100,000 cars. That was a shortage for one day. What the shortage would have been the next day, if that shortage had been filled, I don't quite know, but at any rate a shortage of 100,000 cars for one day was a serious thing—a serious thing in showing that there was more business than the railroads could handle.

I won't go into the question now as to whether that was a car shortage or an engine shortage, or a shortage of men or a shortage of brains. Men were very hard to get a year ago. It has been hinted by a great many people that it was a shortage of brains, and that the railroads ought to have done better than they did. Of course, that is something that railroad men cannot deny. But, unfortunately, there are only so many of us. We are running the railroads now, and while undoubtedly we can't run them as well as the theorists, yet we are trying to run them as well as we can, and we are about the only people you have got to run the railroads now—the only people who are willing to try to do it. So I will leave that part out, and I will call it a car shortage. Really, a transportation shortage would be a better term for it, because while cars were scarce in one place they were congested in another.

These reports were made to an office we have in Chicago. We gradually increased the number of roads reporting and now have about 160 reporting to us regularly, covering practically all the larger railroads. We had no idea that these reports would be of any interest to the public, and we did not publish them. When the spring came surpluses began, and we were able from our office in Chicago to indicate to the railroads which had a shortage that there were surpluses of cars on other railroads, and we did a good deal of shifting around and a great deal of good in that way.

When the summer came there were surpluses everywhere, and we could not do any work in that direction. In the meanwhile the American Railway Association had a meeting and had approved these plans of ours and had ordered us to publish, monthly or oftener, the results that we got from our reports. As the summer passed the supply became uneven again; there were surpluses on some roads and shortages on others, and again our bureau was somewhat efficient in indicating to railroads where cars could be sent to get the full use of them. When we came to October the shortage had increased so, that we were nearly in the same shape that we were in February, that is, there was a shortage of ninety thousand cars in the whole country. That was on October 30.

It was not until the middle of November that we began to feel the result of the panic, when the shortages dropped to 47,000. By the end of November the shortage had dropped to 17,000 and the surpluses jumped up to 40,000. Since that time, up to February 5, the surpluses steadily increased, and now they are about stationary, with the small diminutions I have spoken of.

I simply say this to show its bearing on the situation of the roads in general. A surplus of 300,000 cars means that 300,000 cars are not earning money. During times when cars were short, the cars of American railroads were earning nearly \$2.50 a day gross; in some months it was less, but in September it was \$2.50 exactly, as it happens, for all the cars. The railroads now have on their hands 300,000 cars which are not earning them anything a day. Those 300,000 cars were bought, practically all of them, in the last 12 months. Over 300,000 cars were bought in the year 1907, and they cost \$300,000,000.

I hope this isn't to last very long. I hope the railroads are not going to lose that money; I hope that next fall there will be a revival; I hope this spring there will be a revival of business, but if there is, it will not use up the cars, because we always have a surplus in the summer. I hope, however, that next fall there will be such a revival of business that all these cars will be used; but meanwhile the railroads are already staggering under their loads, and I do not believe that you gentlemen will help to put another burden on them.

As regards the burdens which the passage of this bill will put upon the railroads, the proposers of bills like this uniformly say that the bills are for the good of the railroad, that they are reciprocal, that they are fair. Gentlemen, they are not for the good of the railroads, they are not reciprocal, they are not fair. This bill will give the railroads of Massachusetts nothing, no right which they do not now possess. And, furthermore, it crystallizes into a statute law a custom which all the rest of the country had hoped New England would voluntarily give up, and that this is the custom of giving the merchants of New England twice as long to unload their cars as it gives the merchants in all the rest of the United States.

The gentleman who has proposed this bill said truly that it was modeled on the laws of a number of other states, states I may say, in the South, in the Southwest and the extreme West. I think Vermont is the only one of the New England states that has a law of this character. But with the exception of Vermont—and the Vermont Act is a very recent one—everyone of these acts, and everyone of the rules framed by state commissions, gives a basic free time of 48 hours for the loading or unloading of freight cars. That is usual in the country.

The law of the state of Connecticut, which, by the way, is not a so-called reciprocal law, but simply a demurrage law—gives 96 hours. That, I am told by the lawyers, is only valid on intrastate traffic. But the railroads of Connecticut, not desiring to make a distinction, have always given freely, 96 hours to all traffic, interstate as well as intrastate, and the other railroads in New England have followed those of Connecticut. So that New England is peculiar in that it does not allow the railroads—well, I should not say that—in that two of its states do not allow the railroads to force an unloading in 48 hours, but give everyone 96 hours, and the other states of New England have followed them, so as to make no discrimination between the citizens of Massachusetts, for instance, and of Connecticut.

Based on that 48 hours, there are, to be sure, exceptions in a number of states, by which certain trades and certain kinds of goods, are allowed more time. For instance, in the South, people living so many miles from the station have an extra day. In certain states there is more time for certain commodities; for instance, in Chicago there is extra time for sampling grain, and so on. There is extra time for reconsigning coal and things of that kind, which I dare say you undoubtedly have to have here, and do have here. Although this bill does not give the shipper the right to it, trade demands various exceptions of that kind. But the base of the whole thing is 48 hours throughout the United States, except in New England, where the basis is 96 hours free time.

I am sorry to say that extra privilege is reflected in your railroad performance. If you look at these figures in our reports, the reports of the Committee on Car Efficiency, you will see that freight cars in New England do not travel as fast as they do in the rest of the country. The average miles per car per day which the railroad men of New England are able to get out of their cars is not much more than 18 miles; and, taking the whole United States, you will find that there are some months where it runs up to 25 and 26 miles. You will find some railroads where it runs up to over 30. New England railroad men tell me, and I believe them, that one reason why freight cars in New England are less efficient, if you measure them by the miles per car per day, is because they are up against this four days for unloading and four days for loading. You can easily see how this is so. The average freight run, for instance, on the New Haven road, as I understand it, is 90 miles from point of shipment to point of destination. Now suppose the shipper takes four days in which to load a car, and the consignee takes four days in which to unload it, and the New Haven takes one day in which to run it 90 miles, you have 90 miles in nine days, and that is 10 miles a day. Now, I submit that that is unreasonable; I don't believe your merchants need it. I do not believe your merchants take it, all of them, but some of them do, undoubtedly, or else there would not be the large amounts for car service which are being collected. And that means, gentlemen, that there are some people in New England who are using cars for storehouses, and who did use cars for storehouses all through last winter when the country in general was crying for the use of cars.

I simply say that to explain my extreme surprise, when I happened in town a couple of weeks ago and found that one of these bills was up here. Why New Englanders, with their extra two days, could want a bill of this kind was more than I could possibly see. But I don't want to go into the reasons why this bill may have been brought in. I want to treat it on the broadest possible grounds, and I submit that this question of preference, of extra privilege that the Massachusetts and the New England merchant has over the merchants of all the rest of the country, is a very important thing, and one that should be considered very thoroughly. I hope if this matter ever does come to be a matter of legislative action or of commission action, that you gentlemen will say that 48 hours is a reasonable time in which to unload freight cars, and I hope that New England will voluntarily give up this privilege, which has caused the rest of the country so much car shortage. I would like to see Massachusetts and New England lead the way in this matter of demurrage by giving up a concession which they have had for many years, but which they at last realize is an unjust concession. I believe that the people of Massachusetts, if they only understood the case, would say to the railroads: "We don't want any special privileges. If the other merchants in the rest of the country can unload in 48 hours, we can; we don't want two extra days; we want to stand on the same basis as the people of the rest of the country."

Now, gentlemen, coming back to the hardship that a bill of this kind would put on the railroads, in the first place it demands that



whenever a man orders a car, or cars, without limit—that is to say, whenever a man orders 100 cars or 1,000 cars, or 10,000 cars—of course, that seems absurd, but the bill allows it; when a man orders a car and he does not receive it in four days, that man gets a dollar; the next day he gets another dollar. He can name the points. He can take a siding, where you can only place five cars, and he can order ten cars there, and if they don't come he can collect his dollar. That is a hardship—I have called it that, but it really is an impossibility. But, leaving out the absurd side of the case, the railroads want to fill all orders; the railroads do fill all orders whenever they can, and when cars are scarce the railroads do their best to avoid discrimination in the filling of such orders as they can fill. The railroads want to fill orders for cars because they want to collect the freight money. Whenever a railroad cannot fill an order for a car it loses that freight money. There is one fine. Are you going to put another fine on of a dollar a day a car in addition to the losing of the freight money?

The question of car supply is not a simple one, it is a very complicated one. It is simple enough at a point where the same number of cars come in loaded and go out loaded. It is simple enough at the factory, which gets in so many cars loaded with one kind of material, manufactures the material and ships its goods out at about the same rate every day. It is simple enough when the trade is regular. But, in general, trade is not regular; trade is irregular. And that is the bottom of the difficulty with the question of freight car supply.

The regular trades, the factories where the receipts and shipments are practically regular, the great cities that consume about the same amount and ship out about the same amount, are pretty well taken care of in this country. The trades which pay a good rate of freight are pretty well taken care of in this country. The high class and the perishable freight is well looked after, but when you come to freight that moves irregularly, when you come to freight shipped, for which there is no storage, and which also moves irregularly, then there are difficulties with car supply, and there are difficulties which can only be gotten over by the expenditure of tremendous amounts of money, which would result in the providing of means for transportation that would only be used for a few weeks in the year.

In order to be entirely impersonal, I will speak of the coal trade first, because I think no coal man appeared for this bill; and, secondly, because being on the Baltimore & Ohio, I am familiar with the coal trade. There are no points of storage for bituminous coal at the mines; there is practically no storage for bituminous coal anywhere else except at certain docks on the Atlantic and the Great Lakes. There is a supply of coal in the mines all ready for shipment, three or four times the possible facilities for shipment. I am quite safe in saying that. There is coal in West Virginia on the Baltimore & Ohio, coal opened up, coal all ready to dig out of the mines and put in cars, in that one region, which would exhaust all the transportation facilities of the Baltimore & Ohio, and would leave us mines in Ohio, Pennsylvania and Maryland without a coal car.

The coal trade is all right in the summer, the regular coal trade goes along, everybody has all the cars they want and a lot of mines are shut down and a lot of mines are working half time. But when you come to the winter the price of coal goes up and every mine in the United States wants to ship coal. There is the coal; they take your inspector down and show him the coal, and they say: "There is the coal; give us cars. Here are contracts; we can sell this coal; give us the cars." It is a perfectly safe bluff for them to say that they can load the coal and sell the coal. They know perfectly well that there are not coal miners enough in the country to load all the cars; but we cannot prove that to them, because we have not got the transportation facilities, and it would be extremely stupid for the coal roads of the country to go ahead and provide transportation facilities to take care of the first winter rush, because after the first week's shipments there would be so much coal on the market that they could not ship any more for two weeks.

The coal trade is possibly an extreme case, but I have heard of cases where the live stock men in a region in Texas all wanted to ship the same week; they all had notes coming due about the same time, and they did overcrowd some of the roads out there in such a way that it was just as impossible for them to supply transportation for live stock in the time selected as it is for the Baltimore & Ohio to supply the cars for coal in the first cold snap of the winter. But the same thing is true of every one of the great staples which moves irregularly where the prices fluctuate, and where people want to ship when prices are high and do not want to ship when prices are low. A provision of this kind, fining the railroads so much a day for not supplying cars at any time, would be a tremendous burden on any railroad which originates traffic, at the time when prices happen to be high on the particular commodity which makes the bulk of the railroad's business. That is a perfectly genuine burden, and a burden which would infallibly fall on the railroads of this country. It would be a fine in addition to their losing the freight money, which is, I submit, a sufficient fine.

But if a real shortage occurs through different coal men wanting to get their coal in first in a time of high prices, you can easily see how several coal men could combine to put in orders that it would be absolutely impracticable for a railroad to fill. Suppose several men in one line of trade were to combine to put in orders at a certain point that could not possibly be filled by the railroad, the railroad goes ahead and pays its dollar a day, pays its fine and enlarges the facilities at that point. It would be perfectly easy for those men, when the facilities were put in, if the dollar a day felt warm in their pockets, to change their orders over to a siding ten miles away and insist on having the cars there. This is not an extreme case. When one of these bills was near passing in one of the western states, a representative of a large traffic industry came to a friend of mine and said: "Now, when this bill gets through we can readily shade that rate we were talking about by your simply failing to deliver our cars at such and such a place." Now, that is pretty bad, gentlemen, after we have sweat blood, after we have undergone all these losses in the hope that we are going to get rid of rebates, in the hope that we are going to be sustained by the government in treating everybody exactly alike, to have it proposed that something of this kind be introduced into the law which will open another door like that to rebates!

So much on the question of car supply. The other feature of this bill is the 50 miles a day. Well, that seems reasonable; we do move our freight 50 miles a day, and more; we average more per loaded car—a good deal more. But that is the average, and there is lots of high-class freight that we move a good deal quicker than that, and there is a lot of low-class freight that, while we may move it at that average, we do not move every car as fast as that, and we cannot move every car as fast as that without its costing us a great deal of money. The demand for this regular movement comes from men engaged in handling these staples to which I have alluded—coal, grain, hay—staples which are moved at very low rates of freight. And they pay us very little for moving these staples, and they do not get the best service. I suppose that on every railroad grain and coal are the cars that are moved last. Whenever a train pulls out of a yard they move everything else out and leave the grain and the coal, simply and solely because those pay us least. If you want the grain and the coal moved regularly they have got to be paid for.

I had this matter up in Washington with an official a little time ago. We were talking about grain. We were putting a reconsigning charge on grain of \$2 a car, I think, and there had been a protest from Philadelphia people, and this gentleman said to me: "Now, Mr. Hale, these people say that if their freight was moved regularly they wouldn't have to consign it to intermediate points and reconsign it. If it moved regularly they could ship it straight through to destination, but they start a car of grain from Chicago or Kansas City and they don't know when it is going to get in." And he said: "Mr. Hale, we don't want to prescribe a rate, so many miles a day, but why don't you prescribe it on your tariffs? Put it as low as you like; but why don't you put on your tariffs a proposition that for this rate freight will be moved a minimum of so many miles a day!" I said: "That seems right, but I cannot consent to guarantee any time on freight which pays us less than three mills a ton mile." "What," he said, "does grain move for that?" "Yes," I said, "it does on the Baltimore & Ohio Railroad; it moves for less than three mills per ton mile." And he said: "I cannot believe it." So I sent him the figures the next day for the preceding month, and for other months.

New England coal pays us about the same rate. I don't know what hay pays, but I imagine that the hay from Michigan, which was alluded to here a couple of weeks ago, must pay a very low rate indeed. However, the hay question is another question which I will come to later.

I was comparing notes with one of your iron men here, when I was here a couple of weeks ago, and I found that our average rate on grain from Chicago was about the same as he was paying on iron from Pittsburgh. Now, I am not a rate man, I am not a traffic man, I am just a car man, but I have to get into rates occasionally, and I think if you look into the matter you will find that this grain, which is making all the trouble, can't be paying more than three mills per ton mile. And, honestly, I believe it costs the road that much to haul it. That rate, of course, is made in competition with the Gulf. Grain can go down the Mississippi very cheaply—I mean on the railroads paralleling the Mississippi river—for they have no hills and they can take long trains, and naturally they can do the work very cheaply, and so they cut under our lines and we have to bring the rate down.

I submit to you that for freight moving at rates of that kind it is impossible to guarantee time. And I want to tell you just what guaranteeing time means. Freight of high class is moved on schedule trains and is moved with approximate regularity. Whenever there is one of these special cases for which we get blackguarded occasionally, where a car of high class freight is moved very badly, it means either that the car has broken down, and broken down at a point where it cannot be repaired promptly, or that it gets

into some kind of a congestion, and in order to keep the road open, the yard and trainmasters feel obliged to move other cars first and let this car stay, it being in an inconvenient point in the yard. Those are the only two occasions when freight of high class is moved slowly, and I think our claim departments always recognize that as to freight of high class; and if there is any real damage accruing, I think they are doing the right thing in the payment of claims.

But, when you come to freight of low class, it is moved in slow trains, it is moved in full trains, and if you are going to make us move that at any definite rate, say 50 miles a day, it means that in order to avoid our fines we will have to clear up every yard every day. That seems easy, it seems a simple thing to say that we must have enough power to move everything out of the yard by midnight. To clean it up and move everything out that has come in there during the day. It seems simple, but, gentlemen, it means a pretty expensive thing. It means a light train, a train not loaded to its full capacity, from, well, more than half the yards every day; and it means an expense which I have never felt justified in recommending to my management, even at times when we were making the most money, even at times when we needed cars most. To contemplate a law that will practically compel every railroad in this country to clear up every yard of all the slow freight every night, is something appalling to me. One could make figures on that, one could assume what it cost to move a train, and the amount that is lost in not moving a full train, and how many yards there are in the country. That would show as appalling figures as I have shown the railroads are loading. But that would be very largely speculative. The only point I want to make clear to you, gentlemen, is that this 50 miles a day, reasonable as it seems as an average, is very unreasonable as a minimum, when coupled with the extremely low rates of freight that the railroads are getting on the staple articles. And I submit to you that in the present situation of the railroads of the country, they are in no shape to bear burdens of that kind.

The real difficulty of which these gentlemen are complaining, if there is any, is one of discrimination. If any shipper is faring better than another shipper in the same line in his car supply, that is discrimination, and there is plenty of law to punish that. I do not believe that there is any conscious discrimination by the railroads of this country now. If any, there is at least so little that it does not show. I know that in order to avoid discrimination the railroads of the country are making the most strenuous efforts, and I know that in all its searching the Interstate Commerce Commission seems only to have caught a couple of cases. If they are real cases, I am very glad they are caught, and I think every railroad man in this country is glad that discrimination and rebates have ceased, as I believe they have. We do not want them. They were at one time considered a necessity, just as they are considered a necessity in almost every other line of trade. But it is very much more convenient for the railroad men to make a set of cast-iron rules and live up to them.

The Hepburn Act has helped us more in avoiding discrimination than anything else has. Prior to the passage of the Hepburn Act there were many shippers who would not pay demurrage, absolutely would not pay it at all—would hold our cars indefinitely and would not pay us demurrage, whereas other people were paying it. And the law was not clear that that was a discrimination. The Hepburn Act put demurrage on a plane with transportation, and to give a man a preference in demurrage is just the same as giving him a rebate. Since that time, we have had very little difficulty with the collection of demurrage as compared with what we had before.

I gather that the interest most concerned in this bill is the hay interest. Hay is an article which, when there are no demurrage rules, is usually handled on commission, and in the old days, when I was in Philadelphia and in Baltimore, before we were able to collect demurrage fully, the hay trade escaped demurrage very largely, because we had such frequent blockades of hay. Hay was at that time handled very largely on commission, which, of course, means that the commission merchant solicits shipments of hay, and that shipments are made at the owner's risk, practically, and often without notice to the merchant. The consequence used to be that whenever the price of hay went up, all the farmers who raised hay would send it in from all parts of the country, and before we knew anything about it, we would have more hay than we could deliver, and the hay would be backed off on sidings. I have known hay for Baltimore embargoed by all the railroads for three months, simply because the price happened to go up for a little while, and all the farmers in creation sent their hay to Baltimore in hopes of selling it on commission. That was, of course, a bad thing for the farmer, because the minute there was a glut of hay the price went down. I suppose the commission man finally got his commission out of it. I hope he did, but nobody else got much of anything out of it, and the railroads were very seriously embarrassed.

The difficulty with the demurrage was this: the hay men would not pay demurrage until the car was placed, until they could unload it, and so many cars of hay came in that it was absolutely

impossible to place all the cars so they could be unloaded without filling up all the tracks which we needed for other freight, and there were always a lot of cars held in the outer yards, where the hay men could not get at them, and they would not pay demurrage on those cars which were held back. I notice someone has kindly put a provision in this bill, which will save the hay men paying demurrage on cars held back. The railroads are kindly allowed to collect demurrage on cars not unloaded within 96 hours, computing from 7 a.m. of the day after notice that the cars have been placed at a point accessible for unloading has been given. Now, if you pass this bill, it is a grave question whether the hay men cannot get an absolutely unlimited amount of hay into Boston, and by simply unloading the cars that are placed where they can get at them, compel the railroads to keep a supply back on which no demurrage is collected. After our difficulties in Baltimore and Philadelphia, we built hay warehouses to help out with the storage, and then we had it understood, and it is understood everywhere in the country for all classes of freight now, that if a man has a certain number of cars to unload, and if more cars come in so that they cannot be placed, demurrage accrues on those cars back in the outer yard just as much as it does on the cars which are placed. That is the principle of constructive placement, as we call it. We notify the man who has these cars standing that the cars are ready for him, and that constitutes a constructive placement. We give him two days (it would be four days here)\* from the time the car arrives in the outer yard, and then demurrage begins as long as he has cars which he can unload but which he does not unload. This bill takes away that power if it can be taken away; that is a question for the lawyers, of course. I hope it cannot be taken away. It would seem unreasonable to make a railroad hold cars out indefinitely when overshipments have been made.

The result of this action of ours in charging demurrage on those cars held in the outer yard, when there were cars which the shipper could unload, was to change the method of doing business very largely, and stop the handling of hay on commission, so that now hay coming to Philadelphia and to Baltimore, and I think to almost all other cities—I understand that it is increasing here now—is bought at the point of shipment, and does not come into the large terminal unless it is needed. Then it is not delayed. Of course when a merchant gets held up on a thing of this kind, when he is forced to pay demurrage, after he has for a long time been using cars for storage, he does not like it, and it is very natural for him to try to get back at the railroad. If he has to pay a dollar a day demurrage, it is very natural for him to say: "Can't I get the railroad to pay this dollar to me in some other way?" And I think the word "reciprocal" as applied to demurrage simply means an attempt to get back. It is not reciprocal in the way of giving something, but it is an attempt to be reciprocal in the way of getting something back, generally.

If the railroads do not charge demurrage on their cars, then there grows up a set of merchants who do business in their hats and use cars for free storage. That you all understand. I do not think I need dwell on that, but I would like to say a word about what the railroads are doing in this matter, and what they have done.

In the old days the car shortages were influenced and increased by the custom between railroads of charging each other for the use of cars by the mile. That put a premium on slow movement, and the movements of foreign cars in the country were then about what they were in New England; so the roads got together and decided to pay each other by the day. That was done about six years ago. They have increased the rate. During the extreme car shortage they got the rate up to 50 cents a day, and during that time they paid very considerable sums of money for our bureau in Chicago, which kept a very elaborate record to show where the cars were. The railroads have spent a great deal of money and taken a great deal of time to try to handle this matter properly. They are still at it. They have recently reduced the rate to 25 cents, because cars are not so scarce. They have appointed a commission of prominent railroad men to consider the subject and report, and I assure you that the railroads of this country have the question largely at heart. It is evoking more interest now than it ever has before.

The railroads understand now how important this thing is, and they are progressing toward a better method of car distribution much faster, I submit, than they will if one state attempts to tie them up in one way, and another state in another way.

A track watchman near Cologne, Hungary, for the substantial reward which the railroad usually pays to men who prevent accidents, unscrewed the nuts and removed the fish-plates at a rail joint, waited till an express train came in sight, and then laid torpedoes on the rails and brought the train up standing. The engineman, however, thought that the watchman had had plenty of time to fasten the joint after he saw him, and whispered his suspicions to a policeman. The next evening a tramp visited the watchman and said: "I saw your little game with the rail-joint. Bully for you! Of course I won't give you away; but when you get your hundred marks reward you'll let me have thirty, and then I'll be sure to



remember." The watchman agreed, gave him a mark to bind the bargain, and agreed to meet him again the next day. The tramp was promptly on hand; but then he had his police uniform on. The watchman was tried and confessed. The State's Attorney said: "Judge, this is a serious matter. I ask for eight months in prison." The Judge said: "It is a serious matter indeed. Twelve months in prison and forever disqualified for any place in the railroad service."

#### Thermit Welding Instruction Book.

The Goldschmidt Thermit Co., New York, recently issued a book of instruction for the use of thermit in repair work, devoting particular attention to locomotive frame work. All through the book the writers urge the necessity of paying especial attention to the pre-heating of the parts before pouring the metal, and insist that the neglect of this precaution is apt to produce bad results.

As the process has now become so extensively used for this class of repairs, the detailed instructions of the company cannot fail to be of interest to all who are called on to weld frames in division shops or round-houses, where it is either impossible or undesirable to disconnect the frames from the cylinders and boiler. The instructions are as follows:

After having removed such parts of the engine as to make the fracture accessible and allow room for a mold box about 1 ft. wide, a series of holes should be drilled along the line of the break.

If the frame is a small one,  $\frac{3}{4}$ -in. holes should be drilled; if a large one, 1-in. holes.

Next clean the frame thoroughly at the fracture, as it is important that the thermit steel should come in contact with clean surfaces only.

The frame should now be placed in perfect alinement, and punch marks made on each side of the fracture within convenient reach of trammel points, yet far enough apart to be outside of the mold box, so that there may be no difficulty in regaining true alinement at the end of the welding operation.

Jack the frame open about  $\frac{1}{2}$  in., to allow for contraction when the metal cast around the frame cools. The amount of this opening, however, must often be left to the judgment of the operator, as it depends on the width of the thermit steel collar.

Where the fracture occurs in a vertical member, or "leg" of the frame, it is necessary to construct a sand mold of such design as to cause the thermit steel to run through a gate to the lowest point of the mold and rise through and around the parts to be welded and into a large riser. The gate should not allow the thermit steel to impinge directly upon the metal of the frame, and the mold must allow for a band, or collar, of thermit steel to be cast around the defective parts or the ends of the pieces to be welded. The thermit steel flowing through this space in the mold will dissolve the metal with which it comes in contact and amalgamate with it, forming a reinforcement, which adds to the strength of the original piece, and

must not be machined off entirely, although in case of necessity it may be removed from one or two sides.

The shape of this band, or collar, must resemble, in cross section, approximately the segment of a circle, the thickest part being directly over the fracture and sloping off gradually toward the edges. It should overlap the edges of the fracture at least 1 in.

The thicker the metal to be repaired the thicker must be the band of thermit steel, and the dimensions in general must make allowance for the nature of the repair.

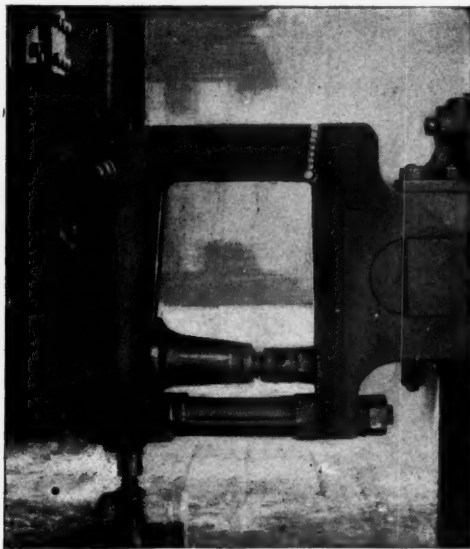
The matrix or pattern of the part to be repaired with the reinforcing band around it is first made, and from this a mold is constructed.

The best material for making molds is one part of fire sand, one part good fire clay and one part fire brick, thoroughly mixed in the dry state and moistened just enough to pack well.

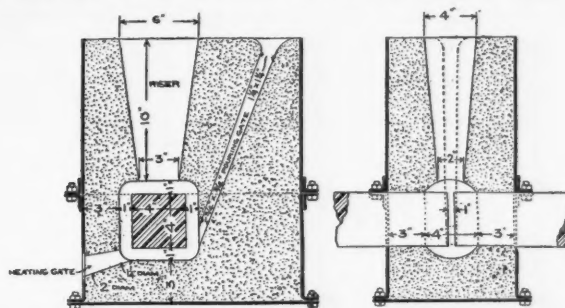
As practically no two repairs are alike, the time and cost of making wooden patterns is considerable. A convenient way to make the molds for this class of work, therefore, is to use yellow wax as a matrix.

The parts to be welded are prepared for welding as previously described, and a wax pattern of the exact form desired in the final weld shaped about them, care being taken to fill up the opening between frame ends with wax. After this is done, molding sand is tamped around the matrix in the usual manner, except that a small hole is left at the very lowest part of the mold, as shown in the illustration. It is advisable to bend a small piece of copper tubing through the wax leading from the small hole at the bottom into the riser. This will make a passageway for the hot gases from the torch and greatly facilitate melting out the wax.

The patterns for runner and riser are best made of wood. Their volume should equal the volume of the reinforcement or collar which is cast around the fracture, as the first steel running out of the crucible into the mold becomes chilled when coming in contact with the metal of the frame, which, even when preheated, has a considerably lower temperature than the thermit steel. The chilling effect can only be overcome by a sufficient quantity of thermit steel, so that



Fracture on Locomotive Frame, Opened up by Drilling and Held in Place by Jacks in Preparation for Thermit Welding.



Sectional Views of Mold for Thermit.

the chilled portion is driven up into the riser and is replaced in the reinforcement by metal which has practically the full temperature it received during the reaction.

When the mold box is completely filled, the wooden runner and riser are withdrawn and the mold is then ready for the preheating and drying operation, which is performed without removing the mold from the frame, the wax running out during the preheating.

Place crucible in position with bottom directly over pouring gate and not more than 4 in. away. Charge crucible, but do not put in ignition powder.

Now direct the flame of a powerful gasoline-compressed air torch into the hole at the bottom of the mold and continue heating until the frame is red hot. It is important that the frame be red hot at the moment of pouring the thermit steel in order that blowholes and shrinking cavities in the weld be avoided.

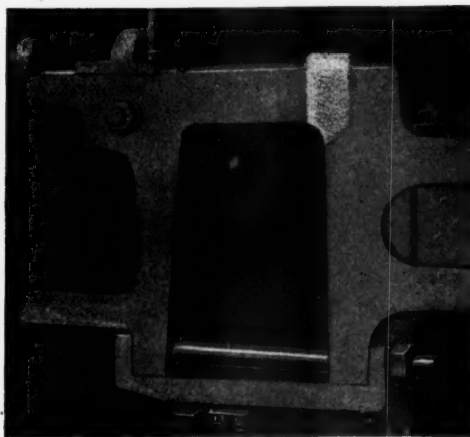
When it is assured, therefore, that the frame is at a good red heat, quickly remove the torch and plug up the preheating hole with a dry sand core, backing it up with a few shovelfuls of sand packed thoroughly. Place one-half teaspoonful of ignition powder on top of the thermit in the crucible. (Thermit will not ignite from the heat of the torch and the reaction cannot be started without ignition powder. Ignite this with a storm match, applying same immediately after striking. When the reaction has ceased the thermit steel may be tapped into the mold by giving the tapping pin a sharp knock upward with the tapping spade.

In about five minutes from time of pour, release the screw jack and allow the frame to return into its original alinement, as shown by the punch marks. It is advisable, however, to draw up on the weld by means of clamps, jacks or other means, in order to relieve this section from the strains incident to the cooling of the metal in the weld and adjacent parts of the frame.

Do not disturb molds for at least two hours after pour.

After removal of mold, drill through riser and knock off gate and riser.

It is important to remember that if the weld is to be made on one member of a double-barred frame, it is necessary to heat the



Finished Thermit Weld on Locomotive Frame, with Reinforcing Collar Surrounding Fracture.

other member with a torch in order to get equal expansion and contraction in both members and prevent unequal strains.

One cubic inch of steel weighs  $4\frac{1}{2}$  oz. To produce  $4\frac{1}{2}$  oz. of liquid steel requires 9 oz. of thermit. Therefore, to calculate the amount of thermit to use for any repair, first find as closely as possible the number of cubic inches in the reinforcement to be cast about the defective part. Double this to allow for metal in runner and riser. This number multiplied by nine gives the number of ounces of thermit to use.

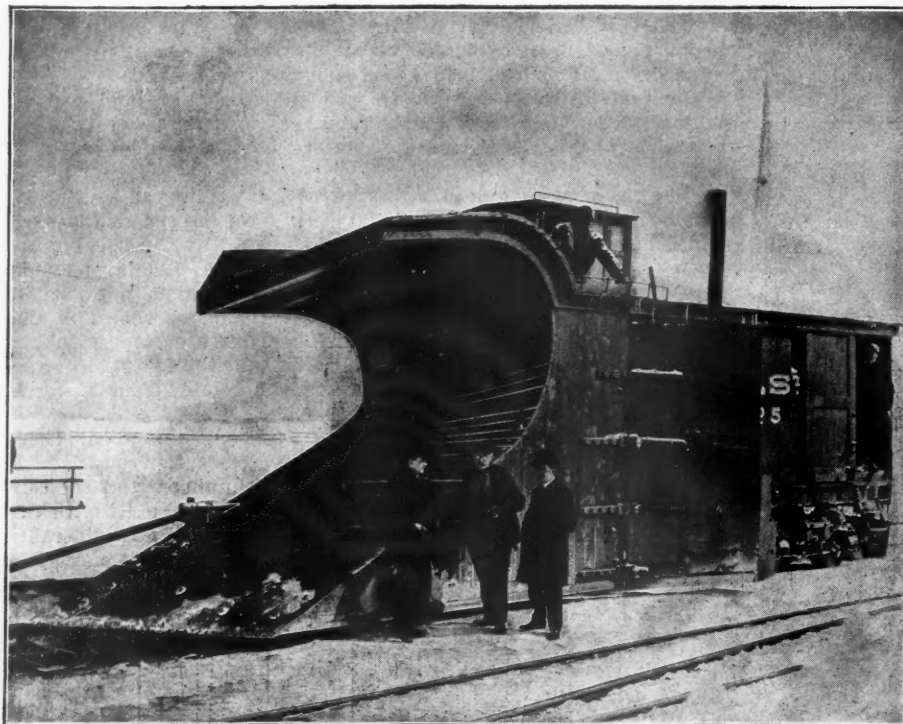
A simple method of determining the amount of thermit necessary, when wax is used for a pattern or matrix, is to weigh (in

The crucible is closed before charging with "plugging material," consisting of a tapping pin, asbestos washer, metal disk and refractory sand, made up in small paper packages and supplied ready for use.

First the tapping pin is suspended by its scarfed end, inside the "thimble." It must be cut down so that the end will project not more than 2 in. below the bottom of the crucible in order that it may be driven up when the crucible is to be tapped. With the pin cut to size and in place, close the top of the thimble first with asbestos washers and then with the metal disk. Ram firmly into place with the handle of a hammer, then cover with refractory sand. This is done to prevent the thermit steel from running out prematurely.

The crucible is tapped by knocking the tapping pin upward as previously described.

#### Type of Snow Plow Used on Quebec & Lake St. John.



Type of Snow Plow Used on Quebec & Lake St. John.

pounds) the quantity of wax on hand before and after building up the matrix. The difference multiplied by 32 gives the weight of thermit required in pounds.

It is necessary, when more than 10 lbs. of thermit are to be used, to mix steel punchings or particles of steel, free from grease, into the thermit powder. The intensity of the heat of the reaction will be moderated thereby without interfering with the efficiency of the weld. In all cases the punchings should be preheated before mixing with the thermit. For 10 lbs. or more of thermit a proportion of 10 per cent. of punchings should be added. For quantities of over 50 lbs. of thermit, as much as 15 per cent. of small, mild steel rivets may be mixed in.

An addition of 2 per cent. of pure metallic manganese (based on weight of thermit) should in all cases be added, as this materially increases the strength of the thermit steel. Where metallic manganese cannot be had, however, ferro-manganese may be used, in which case 3 per cent. of the 20-80 alloy is recommended. The pure manganese is, nevertheless, preferred to the ferro-manganese, owing to the fact that where large quantities of thermit are used an addition of the latter tends to increase the violence of the chemical reaction.

The thermit reaction takes place in a magnesia-lined crucible, which has at the bottom a hard burnt magnesia stone. This latter again has a tubular opening, into which a small magnesia stone or so-called "thimble" of conical form is made to fit. This thimble provides the channel through which the liquid thermit steel is poured. The outlet must not be wider than  $\frac{1}{2}$  in. After a few runs have been made the thimble should be replaced with a new one. It may be removed by carefully knocking upward and a new thimble, folded around with a layer of ungreased paper, inserted in place.

The Quebec & Lake St. John runs from Quebec north to Lake St. John, and from there east to the Saguenay river, crossing on the way several high ranges of hills. In this part of eastern Canada the winters are sometimes very severe. During the winter of 1907, for instance, there were very heavy snow falls, some great storms and almost continual drifting winds throughout most of the winter, yet through it all, while neighboring railroads were closed for days at a time, the Quebec & Lake St. John maintained its regular service.

This was accomplished by the efficiency of the snow plows used. One of these plows is shown herewith. They were designed and built by men on the road. They are built very solidly of heavy timbers. The wings and flanges are operated from the interior and thus form a combined head plow, wing plow and flanger. These plows exclusively have been used during the last 20 years and have done fine work.

For this information we are indebted to J. G. Scott, General Manager of the Quebec & Lake St. John, who built that road, as well as the Great Northern of Canada, now the Canadian Northern Quebec, which early in 1907 bought control of the Quebec & Lake St. John.

#### Car Surpluses and Shortages, March 18.

The following table is from bulletin No. 19-A of the American Railway Association's Committee on Car Efficiency. It summarizes the car surpluses and shortages from October 30, 1907, every two weeks to March 18, 1908, inclusive, being similar to the table published in the *Railroad Gazette* of March 27, 1908.

There is an apparent improvement in the general situation, the report for March 18 showing 17,950 less surplus cars. This decrease is more than covered in the coal car figures, the only other improvement of any consequence appearing in the flat cars, whose decreased surplus is more than offset by the increase in the surplus of miscellaneous cars. It is probable that a large proportion of the 20,000 less surplus coal cars can be accounted for by the action of railroads and coal operators in storing coal in anticipation of a suspension of labor at the coal mines on April 1.

The Southern, Middle Western and Southwestern groups show horizontal decreases in all classes of cars, indicating an actual improvement in all lines of traffic in those particular sections, which, however, have been somewhat behind the rest of the country in showing signs of a slight rally from the extreme depression shown in January and early in February. In the New England group the surplus equipment continues to increase. The Canadian roads also, which have heretofore shown the greatest improvement, are again accumulating idle cars. Except for those mentioned, there is little change in the group figures.

SURPLUSES AND SHORTAGES BI-WEEKLY, FROM OCTOBER 30, 1907, TO MARCH 18, 1908, INCLUSIVE.

	Number of roads.	Surpluses.					Shortages.				
		Box.	Flat.	Coal gondola and hopper.	Other kinds.	Total.	Box.	Flat.	Coal gondola and hopper.	Other kinds.	Total.
March 18, 1908.....	160	103,509	25,122	119,205	49,206	297,042	533	151	250	73	1,007
March 4, 1908.....	162	103,905	27,232	139,223	44,632	314,992	943	19	600	57	1,619
February 19, 1908.....	161	113,776	30,088	134,217	44,432	322,513	697	141	249	162	1,249
February 5, 1908.....	158	112,046	30,312	156,634	44,936	343,928	737	281	15	67	1,100
January 22, 1908.....	161	124,622	27,328	142,338	48,292	342,580	392	132	79	135	738
January 8, 1908.....	163	149,664	23,087	127,138	41,874	341,763	457	34	42	120	653
December 24, 1907.....	158	87,714	14,740	64,556	42,300	209,310	187	81	191	265	724
December 11, 1907.....	153	48,977	9,888	27,462	33,012	119,339	2,506	420	746	848	4,520
November 27, 1907.....	160	16,246	3,645	10,028	10,429	40,348	11,908	868	2,964	2,224	17,964
November 13, 1907.....	164	4,103	1,208	2,365	4,525	12,201	37,473	3,066	10,914	5,550	57,003
October 30, 1907.....	161	786	600	1,285	1,275	3,946	61,592	3,546	15,987	9,632	90,757



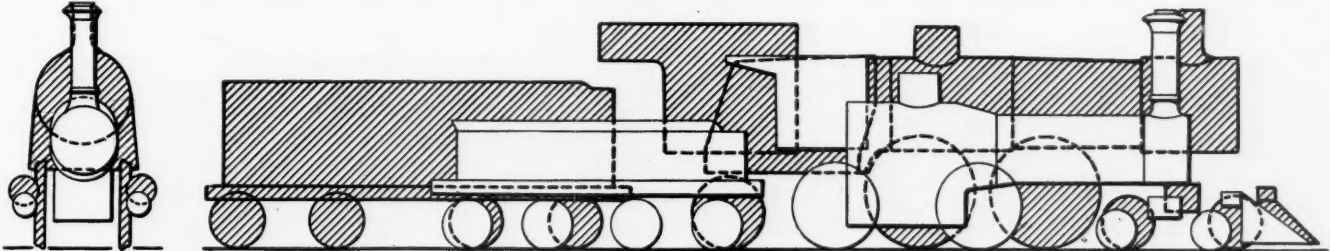
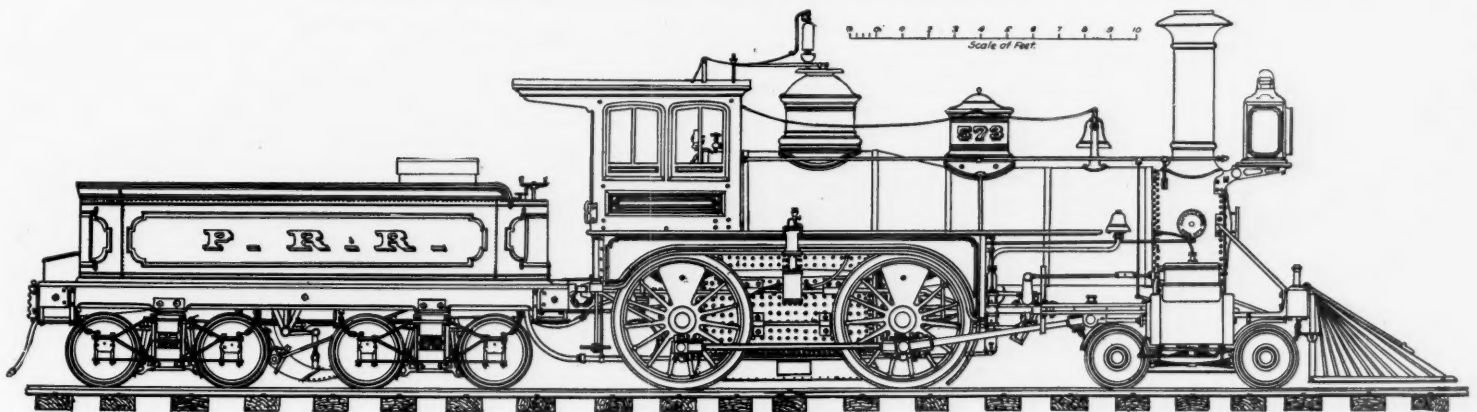
## A Long Continuous Run of 1876, and the Engine That Made It.

BY C. H. CARUTHERS.

As early as 1875 the problem of making a run in 10 hours without a stop from Jersey City to Pittsburgh was considered by the officials of the Pennsylvania Railroad, and preparations were begun to carry out the idea. No. 573, one of the standard Class C<sub>iii</sub> (bituminous) passenger engines, the type at that time hauling nearly all through passenger trains on the various divisions of the road between Philadelphia and Pittsburgh, was selected for the trial. This engine had been built in 1872 at Altoona shops, and was in daily use on the Pittsburgh division. While exactly similar to all other engines of the class, it was believed to be a slightly

was in the vicinity of Pomeroy, Pa., 131 miles west of Jersey City, a young man connected with the motive power department of the company, was struck by a milk shed and killed as he leaned from the car steps in an attempt to see a journal box which he thought was heating. Of course the train was stopped and the experiment was abandoned for the time, and it was not again attempted until during the early summer of 1876.

It was then taken up in connection with an attempt made by a theatrical organization to travel from New York to San Francisco in 84 hours. In addition to engine 573, and its special baggage car of the former trip, the train consisted of a P. R. R. combination car, a Pullman hotel car and one Pullman sleeping car. All the cars were fitted with rubber oiling tubes like the tender and

Comparative Sizes, Standard Passenger Engine of 1876 (C<sub>iii</sub>) and of 1908 (E3A).

P. R. R. No. 573. Built at Altoona Shops in 1872.

Cylinders, 17x24 in. Drivers, 62 in. Weight on drivers, 49,500 lbs. Total weight, 74,300 lbs. Firebox, 35x72 $\frac{5}{8}$  in. Flues, 155; 2 $\frac{1}{4}$  in.  $\times$  127 $\frac{1}{16}$  in. Boiler, 48 $\frac{3}{4}$  in. diameter. Center above rails, 74 $\frac{1}{2}$  in. Heating surface, 1,056.98 sq. ft.

freer steamer, and seemed to require less repairs than its mates. No particular changes were made on it except to equip the journal boxes of both engine and tender with rubber tubes which were carried to convenient locations to enable oiling to be done while running, and of course the entire engine was thoroughly examined and put in condition for such a run.

To provide a sufficient amount of fuel, an ordinary baggage car was used as a storage room for coal and was also provided with a water tank. This latter was to enable the engine to maintain a sufficient supply of water between Huntingdon and Sang Hollow track tanks, a distance of about 75 miles, in which no provision had been made at that time for taking water without stopping, between the points named. The coal passers and other employees except those actually handling the engine also occupied this baggage car as a sort of waiting room.

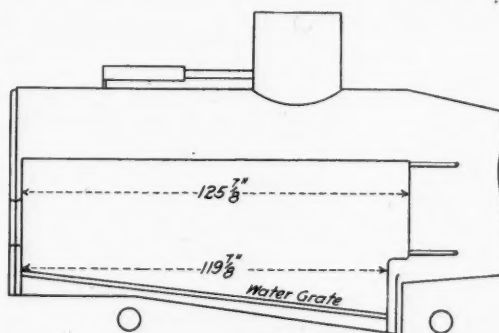
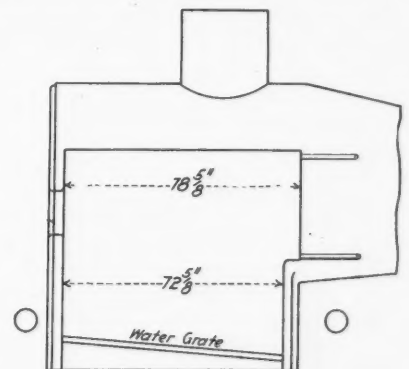
The coal used was especially mined for the purpose at one of the extensive bituminous coal mines near Irwin, in the famous "Pittsburgh" gas coal field. William Phillips, the regular engineman of 573, accompanied it during the entire trip but only ran it over his own division, as enginemen from each of the other divisions were on the train and ran it over their respective divisions.

The western enginemen were somewhat amused at hearing for the first time, during this trip, trips at a nomenclature prevailing at that time among some of the employees of the New York division, and which was evidently derived from the days of the hook motion, not then so very remote, when I believe it was customary for enginemen to say, "Hook her forward," or "Hook her back," and when these men referred to the position of the reverse lever in the quadrant, they substituted "Link her up" and "Link her down" for the western "Drop her down" and "Cut her back."

When the final preparations were completed, a start from Jersey City was made on an autumn day of 1875, and at first everything indicated a successful termination of the trip, but when the train

engine, and also had openings provided in the floors to afford access to the journal boxes. The cars used on the first attempt were prepared in the same manner and it is singular that the young man who lost his life on that occasion should have attempted to watch a journal box from the steps instead of through these safe and convenient openings.

The start was made at 1.03 a.m. June 1, 1876, three minutes after the appointed time on account of waiting for some special newspapers which were to be sent along, and without any subsequent hindrance the train pulled into the Union Station in Pittsburgh

Firebox of C<sub>iv</sub> Anthracite.Firebox of C<sub>iii</sub> Bituminous.

promptly at 11 a.m.—just nine hours and 57 minutes after the start from Jersey City. The fastest time during the run was said to have been made over a strip of four miles on the New York division which was covered in three minutes, and the slowest speed was that of 20 miles an hour observed while passing through the Altoona yards.

Engine 573 was disconnected from the train at Pittsburgh and also the three cars belonging to the Pennsylvania Railroad, but the Pullmans were in a few minutes started out over the Pittsburgh, Fort Wayne & Chicago Railway on their way to the Occident, the Pennsylvania Railroad conductor accompanying them. This latter

part of the trip was claimed to have been made in such time as brought the entire trip within the 84 hours desired from coast to coast, but the interest of railroad men centered chiefly in the 10-hour run without stopping between Jersey City and Pittsburgh.

The line had been kept well cleared to insure success, and the long summer daylight prevailing at the time enabled over 300 miles of the distance to be run after sunrise, so that its progress was watched with enthusiasm by large numbers of people along that portion of the line.

The principal dimensions of 573 were:

Cylinders .....	17 x 24 in.
Driving wheels, diameter .....	62 "
Weight on drivers .....	(about) 49,500 lbs.
Total weight .....	74,300 "
Firebox .....	35 x 72 1/2 in.
Flues .....	155 "
" outside, diameter .....	2 1/4 in.
" length .....	127 1/16 "
Heating surface .....	1,056.98 sq. ft.
Boiler, diameter .....	48 1/2 in.
Boiler, center above rails .....	74 1/2 "
Driving wheel base .....	102 "
Total wheel base of engine .....	22 ft. 5 1/2 "
Length over all of engine and tender .....	54 ft. 5 1/16 "
Steam pressure, maximum .....	125 lbs.
Fuel .....	Bituminous coal

A full-stroke pump on the right-hand side connected to the crosshead, and a non-lifting No. 7 Sellers injector on the left, furnished water to the boiler. Bridges had not come into use on the road when this engine was built and the tallow-cups, and valves for blower, heater and injector were tapped directly into the roof sheet at various points on its surface where it was projected into the cab. A surface cock, or "skimmer" as the men called it, was placed in the boiler head at about the same level as the upper compression gage cock. When first built the engine had no driver brake, but I think one had been put on before the time of this trip. It will also be noticed that the headlight numbers are wanting, that feature not having been introduced until two or three years later; and also that the smoke-box is of the pre-extension type, the extension having only been adopted on the road after 1880.

The stack, although of the straight type, contained a system of spark arresting devices invented by James Smith, an employee of the company, about 1870, and used thereafter on all passenger engines until the coming in of the extension front. The valves were of plain D type with a travel of 5 in. and 3/4 in. lap.

Between 1873 and 1877 a large number of "C" engines were built to burn anthracite coal on the New York division, and only differed from the 573 in the firebox, which was 34 1/2 in. x 119 1/8 in., necessitating it being carried quite through the cab and against the cross frame at the rear, and in being furnished with bridges upon which the tallow cups, blower and valves for heater and injectors were placed. The throttle lever and glands were also on the rear end of this bridge, and the stem extended through the bridge and its pipe into the dome. These latter engines were known as Class C1v, anthracite.

All of both types have been off the road for several years, some having been scrapped and others sold. During the later years of their service several of the C1v type had 68 in. drivers substituted for the original ones of 62 in.

The writer is under obligation to Theo. N. Ely, Esq., Chief of Motive Power of the Pennsylvania Railroad, for courtesies which enabled the verification of a considerable portion of the data from which the foregoing article was compiled.

#### The Work of the Bureau of Explosives.

The report of the Chief Inspector of the Bureau of Explosives of the American Railway Association, Major B. W. Dunn, U.S.A., has been submitted, covering the work of the Bureau from June 10, 1907, to February 1, 1908. From the report we select the following extracts:

On June 10, 1907, the Chief Inspector's office was opened and there was presented to him the problem of organizing the work of the Bureau. In the many difficult situations that have arisen he has received from the executive committee, and especially from the President and Secretary, assistance and advice that have been invaluable and that have been given, not only without financial compensation, but without regard to the demand on their already over-taxed time.

A preliminary study indicated that sound judgment and tact would be necessary to secure success. The agents of the Bureau are invested with authority under specific circumstances, but it was realized that the unwise exercise of this authority would be more than objectionable. These agents are employees of each member of the Bureau and they work over any line under the direction and authority of its General Manager. It is a natural but a mistaken tendency to regard them as representatives of foreign authority. It was also appreciated that the Bureau would have to deal with both operating and traffic departments and that restrictions recommended by it might be unwelcome to those officials whose duties include the difficult one of placating customers. It affords me pleasure to report that, as a rule, hearty encouragement and sup-

port have been received from all railroad officials. It was also realized that manufacturers would suspect our motives in entering their property and criticising their methods. They are divided by competitive issues, and the fear that restrictions placed upon them may not apply with equal force to their competitors is natural.

Careful consideration of all these conditions led to the conclusion that while the policy of the Bureau would be to secure, ultimately, uniform enforcement of regulations, it would be necessary to recognize the fact that the introduction of radical changes requires time proportional to local conditions and obstacles. For example, to insist upon immediate correction of the custom of disregarding almost entirely the furnishing of cars that meet requirements, would paralyze the business of the shipper. After an appreciation of the facts by operating officials, some time is necessary for them to provide the necessary facilities for selection and preparation of cars. In a similar way, the manufacturer who has been violating most of the regulations, and shows a willingness to reform his methods as rapidly as possible, should be given a reasonable time to do so with the important provision that positively dangerous practices must cease at once, even if this requires an embargo on all of his shipments.

The organization of the Bureau includes a Special Agent and 17 Local Inspectors charged with the inspection service; a Chemist and one laboratory assistant and an office force of five in addition to the Chief Inspector.

The following statistics indicate the inspection service of the Bureau during the period stated:

Stations Inspected.	
Total number of stations inspected .....	1,116
Stations found not supplied with blanks and placards .....	628
Stations found where violations as to loading, handling, placarding, and forwarding explosives were observed .....	561
Stations found where leaking explosives had been accepted for shipment .....	30
Factory Inspections.	
Total number of factories inspected .....	141
Number found not complying fully with regulations .....	94
Number found failing only in minor details .....	47
Number found to be failing in important regulations, i. e., driers, boxes of less than required thickness, no lining to boxes, more than 60 per cent. dynamite made and shipped .....	47
Magazine Inspections.	
Total number of magazine inspections .....	583
Number of magazines in which black powder stored showed defects in marking .....	105
Number of magazines in which high explosives stored showed defective marking .....	60
Number of magazines in which leaking kegs of black powder were found .....	9
Number of magazines in which high explosives were stored in boxes less than required thickness or not lined .....	134
Number of magazines showing dirty floors stained with nitroglycerine .....	119
Number of magazines in which high explosives stored were found in leaking and dangerous condition .....	59
Inspections of Cars in Transit.	
Total number of cars containing explosives inspected in transit or after arrival at terminals .....	178
Number of cars which did not comply with regulations as to preparation, loading, placarding, etc. ....	127
Number of cars showing movement of lading, account improper loading and staying, or conditions such as would permit an accident ..	99

The following are examples of cars inspected, showing some violations observed:

Car No. 69,333 containing over two tons of dynamite was inspected and found with cracks in roof, sides and ends; packages were insecurely braced, light material having been used, and this bracing had given away, permitting the packages to shift and slide about the car. Prohibited articles, consisting of loose iron pipe and roll of wire cable in upright position, were loaded in the car; placard on one side only.

Car No. 8,039 was inspected and following result shown: Car of 50,000 lbs. capacity, contained loose boards, cracks in roof and ends, doors not tight and not stripped to prevent entrance of sparks; floor not clean, and had projecting nails and bolts; king bolt not protected, extending 1/2 in. above car floor; packages of dynamite (6,850 lbs.) were not stayed in any way and had during transit been knocked about the car, one box having lid off and cartridges exposed. Prohibited articles, in form of blasting caps and fuse, were loaded with the dynamite. One door of car partly open, and car without required number of placards.

Car No. 1,060 on inspection was found to contain miscellaneous merchandise, black blasting powder, matches and oil; car had crack in end sufficiently large to permit entrance of sparks.

Car No. 88,513 loaded with 10,000 lbs. black powder (blasting) was found with large holes in end of car and over doors. Kegs had not been properly stayed and had shifted, breaking open some of the kegs and spilling powder on car floor.

Accidents in factories in 1907 are shown in the following table:

	Dynamite.	Black powder.	Other explosives.	Totals.
Number of accidents .....	26	20	20	66
No. of injured, but not fatally ..	15	33	14	62
Number killed .....	36	57	8	101
Property loss .....	\$209,900	\$17,100	\$52,400	\$279,400

It is difficult to get reliable information of the causes of accidental explosions, and especially difficult in factory explosions. The amounts stated as covering the property loss do not include many of the explosions and are therefore incomplete. The Bureau has no legal or other right to insist on investigations by its representa-



tives, and manufacturers do not welcome the presence of strangers on such unfortunate occasions.

Among the accidents in transportation during the year 1907 were the following:

January 19, 1907. Sanford, Ind.—Car containing 500 kegs, 12,500 lbs. of black rifle powder, manufactured by American Powder Mills, West Acton, Mass., in train 21 cars from engine and 12 from caboose, between box cars loaded with merchandise—took siding at Sanford. A passing train, consisting of engine, express car and two coaches had reached point where express car was opposite car containing powder when it exploded. Six freight cars were destroyed; express and passenger cars destroyed. Fifteen persons killed; 30 injured; property loss, \$30,000; equipment, \$13,150; total loss, \$43,150, exclusive of damages for loss of life.

Cause: Unknown. It was claimed to be due to criminal act of outside party. It is possible that cars had, during course of transportation, received shocks sufficient, with imperfect staying, to cause powder to leak from kegs, making a train of powder which was set on fire. It is stated lightning struck the car—no evidence.

March 24, 1907. Atlanta, Ga.—Eight boxes of blasting caps, weight 970 lbs., made by the Metallic Cap Mfg. Co., exploded while being handled by employees. Four killed; four injured.

Cause: Unknown. It is possible that one of the handlers used his hook and struck one of the caps which detonated and caused the others to explode. It is also possible that a box was dropped and exploded by concussion.

April, 1907. Covington, Va.—Car containing 16 bbls., 9,400 lbs., permanganate of potash caught fire and burned the car.

Cause: Probably caused by spilled material mixing on floor of car with some combustible substance. Such a mixture is inflammable and can be ignited by friction.

June 4, 1907. Reddick, Ill.—Six hundred (60-lb.) boxes of black powder exploded while in transit.

Cause: Tank car containing naphtha was derailed, causing a number of other cars to leave the rails; fire started and spread to car containing powder. Explosion occurred; three killed; 17 injured. Property loss, \$25,279. Damages for loss of life, if any, not known.

July 21, 1907. Becks Hot Springs, Utah.—Car partly loaded with black powder on siding caught fire from spark of engine from train which passed about 3.28 p.m. Three other cars on siding contained dynamite (amount not stated, probably 2½ carloads), and these exploded at 4.15 p.m. Property and equipment loss \$10,891.

Probable cause: Car with poor roof used.

Aug. 10, 1907. Boulder, Colo.—Two thousand one hundred lbs. Hercules dynamite and 200 lbs. Atlas du Pont powder. Hercules was manufactured July 25, 1907. Result: Three deaths; five injured; loss \$200,000.

Cause: Fire started in freight depot which was destroyed; spread to car containing dynamite and explosion occurred. Regulations covering storage of cars containing explosives evidently not followed. This car should have been placed in safe place where there was no danger of fire. There were 38 freight cars destroyed.

Aug. 11, 1907. Essex, Ontario.—A shipment of 5,000 lbs. of 60 per cent. dynamite cartridges 18 in. long, exploded in a car located in a mixed train between the engine and a coal car.

Cause: During a hot wave of weather the shipment was loaded without staying, in a way car, at Black Rock, N. Y., consigned to Amherstburg, Ontario. During the trip conductor noticed several boxes standing on end, but did not correct the fault. About 24 hours after these boxes were observed to be on end, small explosions were heard which, by investigation subsequent to accident, were attributed to drops of nitroglycerine falling from car to wheel and exploding by pressure of wheel on rail. Conductor with two members of crew entered car and turned boxes on sides. It is probable that this uncovered some hole in car floor, previously partially closed by weight of box, and that a large enough quantity of nitroglycerine reached the wheel during the stop to make the next explosion, just after starting the car, strong enough to cause the explosion of entire lot. At this time the Bureau had not been able to inspect the railroad or instruct any of its employees in our regulations. It can be stated with confidence that a strict enforcement of these regulations would have prevented this unfortunate accident.

Aug. 17, 1907. Ohio street dock, Buffalo, steamer "Utica."—Barrel "liquid cement" in being loaded, fell, broke and scattered contents over floor of hold. Three men with shovels were being used to collect the cement, and a man was engaged in placing shavings around the wet floor. The gaseous vapors became so strong that some of the men complained and left the hold. One man stated he would put a head in the substituted barrel. An explosion then occurred and enveloped the hold of the steamer in flames. Three men killed; two injured.

Cause: Ignition of mixture of inflammable vapors and air by spark from hammer and nail or other source of fire.

Aug. 17, 1907. Kingston, N. Y.—Six barrels "cement" (rubber) loaded with merchandise, on arrival at Kingston were found to have leaked on car floor, and odor of naphtha was perceptible. Railroad

employees entered car with lighted lanterns, fire started and burned freight house, several cars and contents, causing a loss of \$139,841.

Test of cement from these shippers showed the solvent to be 80 deg. gasoline, the most volatile and inflammable grade on the market.

Recapitulation of the accidents in transportation in 1907 shows the following figures:

	Accidents.	Number Injured, not fatally.	Killed.	Known property loss*
Dynamite and high explosives..	6	27	9	\$335,891
Black powder .....	3	47	18	68,429
Other explosives .....	2	2	4	.....
Inflammables .....	6	2	4	139,841
Totals .....	17	78	31	\$544,161

\*Including equipment.

Respecting the relation of the Bureau to its members the Chief Inspector speaks as follows:

No friction of any kind has occurred in this relation. Our inspectors seem to have shown the good judgment and tact emphasized in the list of qualities that guided their nomination and appointment. Effort has been made to keep this relation as harmonious and intimate as possible. Several profitable conferences between the Chief Inspector and bodies of such important railroad employees as station agents and yardmasters have taken place with a view to perfecting the details of regulations. In many cases the Chief Inspector has served as a useful medium in conducting investigations to determine responsibility for violations, where the correspondence would otherwise have had to take place between the officials of different lines. The advisability of having a disinterested party conduct such correspondence is apparent.

In August, 1907, two cars containing a total of 40,000 lbs. of dynamite were held up in Buffalo, N. Y., because this dynamite was of the same grade and from the same factory as that which had exploded a few days previously while in transit at Essex, Ont. The switching road was unable to send the cars forward to destination or back to the factory; and in the meantime it was holding them illegally within the city limits. By report based upon careful inspections and chemical analysis of samples, the Bureau was able to secure forwarding of the cars to destination under immediate supervision of one of the local inspectors. If the shipments had been too dangerous to forward, it would have been necessary to destroy them, and this would have emphasized, to a still greater degree, the necessity for the services of experts of the Bureau.

It is intended to arrange to have the Chief Inspector, or a representative, attend as frequently as possible during the ensuing year, the stated meetings of operating officials of our membership lines, to discuss the transportation of explosives, answer questions concerning regulations, explain the general plans and policies of the Bureau, and in every proper way to stimulate interest in our work and increase knowledge of our regulations.

The relations of the Bureau to the Manufacturers of Explosives are thus described:

It was soon appreciated that the good will and active co-operation of manufacturers are essential to an enforcement of our regulations among their employees. Without their co-operation we could not secure enforcement, even if we maintained an inspector at each of the 164 plants. The basic idea in seeking this co-operation has been to convince the manufacturers that our efforts for greater safety are in line with their interests and that we can be of material assistance to them. When we discover an explosive in bad condition, we endeavor to locate the cause and to furnish full information in regard to it to the manufacturer, with such suggestions as our experience may indicate to improve the product. Our broad experience, based on our connection with all manufacturers and many railroads, will also enable us to place at the disposal of each manufacturer the best methods for loading explosives in cars. We do not disclose, of course, to one plant the improved manufacturing practices in vogue at others, where the information given would be adverse to the interests of the more progressive manufacturer; nor do we violate in any other way the confidence under which information of this kind is imparted to us.

As was anticipated, we were met at the beginning with a frank statement of suspicion that we would not apply our restrictions impartially and uniformly. The small and independent manufacturer could not conceive that a Bureau of this kind would be operated otherwise than in the interests of the larger plants. By exercising proper patience in dealing with individual cases, it is believed that we now have the complete confidence of practically all of the manufacturers. In November, 1907, there was a general acceptance by them of an invitation to meet the Bureau for the purpose of discussing proposed changes in regulations. They appreciated this opportunity to express freely their objections to all proposed restrictions. Each restriction was taken up in turn in the spirit of impartial discussion and with a view to indicating clearly the reasons that prompted it. One result of this conference was the appointment by the manufacturers, at the request of the Bureau, of a committee to represent them in order that future conferences with the Bureau could take place promptly, each member of the committee

representing a number of allied interests. The knowledge that through this committee they will have an opportunity to present, in friendly discussion, their side of any controversy, has had a very salutary effect. It has been made plain that, since the responsibility for any explosions in transit rests entirely on them, the railroads, through the American Railway Association, must retain the right to make a final decision on regulations.

The importance of proper staying of packages of explosives in cars is stated below:

The best of packages are liable to receive injury during transit if not properly stayed. While our regulations have required proper staying, no standard methods have been prescribed, and those in practice are almost as varied as the number of manufacturers. Different methods are used even by plants under the same general management. It is evident that some one method is the best for a particular style of package. The members of this committee of manufacturers were invited to study this subject and to bring to a conference that took place on January 17, 1908, detailed descriptions, drawings and photographs. A day was spent in discussing various suggestions, and arrangements were made for a practical test of what seemed to be the best methods. In these tests, cars loaded with dummy packages will be given as rough treatment as a car should receive in transit, and in due time we shall know what the best methods are. A pamphlet will then be prepared for general distribution describing these methods in order that all staying by manufacturers and railroad employees may be in accordance with them. The result will be a material increase in safety, and, in many cases, this will be obtained by a saving of some labor and material heretofore expended.

The regulations for the safe transportation of explosives and other dangerous articles in their present and in the proposed revised form are treated at length. In this connection the report has the following statement:

The exhaustive and able work of the committee on transportation of explosives during the spring and summer of 1905 resulted in the regulations that were adopted by the American Railway Association in November, 1905, and have been in force since that time. It is natural that an experience of about 2½ years should indicate a number of advisable changes. With the assistance and co-operation of the executive committee, the Chief Inspector has endeavored to revise these regulations. The first revision was published in the proceedings of the Association for October, 1907, and since that time additional changes have been made as a result of the various suggestions received. A galley proof embodying these changes has been distributed to General Managers, and it is anticipated that the final revision can take place in the near future. It is natural that the anticipation of revised regulations should interfere with the enforcement of the present ones, and it is earnestly hoped that the new regulations can be put in effect not later than March 1, 1908.

The following are some of the general ideas that governed the revision:

(1) Definitions and information to be used principally by manufacturers, shippers and inspectors have been collected in Section I. The rules governing the action of all concerned have been placed in Section II. All of the rules referring to packing and marking, and to preparation of a car for any particular explosive, have been brought under one head.

(2) Some relaxation of requirements affecting small shipments of the more dangerous explosives, and large shipments of the safer ones has been permitted in order to facilitate a more strict enforcement of precautions in handling the more dangerous shipments. Even if an explosion of one of these small shipments should occur as a result of this relaxation, the damage will be relatively small, and we shall be benefited, on the whole, if we prevent an explosion of a large shipment. When a large proportion of cars require special treatment it is natural that trouble should be experienced in securing it. The more limited the number of such cars, the easier will it be to secure it.

(3) Elements included under the general head of ammunition have been separated and will be shipped under their proper names.

(4) The authority to use an annual certificate, heretofore granted for small-arms ammunition, has been extended to all kinds of explosives. It is believed that a general certificate from a responsible party will be as effective as the special one so many of which have been required that their use has become perfunctory.

(5) Some relaxation has also been introduced in the requirements affecting the loading of different kinds of explosives in the same car. It is believed to be a correct general principle that any vacant space in a car containing explosives, with a certain attending risk, can properly be used for any other explosive having no greater risk and not bearing to the explosives in the car a special relation which would increase the risk for both. Such a relation is found in the transportation together of detonators and high explosives.

(6) At the end of the regulations is introduced a condensation of rules arranged for the various railroad employees. This should be of material assistance to them and will save

the time required to extract the paragraphs referring to them.

It was intended to have the Bureau supervise the transportation of dangerous articles other than explosives. These articles are included under the general term "inflammables." It is well known that while many railroads have published regulations for this traffic, their employees as a rule treat these articles as ordinary merchandise. Where the regulations are enforced, it is usual to require employees to attach to packages labels conveying general cautions for handling. The attachment of these labels is followed by the attachment to the car of placards calling for special treatment of the car. For guidance of employees in labeling packages it is usual to furnish a list giving the trade names of various articles whose natures bring them within the class of inflammables. This list is long and, even if railroad agents were accomplished chemists, they would not have the time to determine accurately in any given case, whether a package required a label. The result is that they either neglect the regulations, or, to be on the safe side, they label all suspected packages. The latter is the usual case, and it results in placarding so many cars that the regulation defeats itself and special treatment for these cars is not obtained.

While adopting the general principle of labeling packages and placarding cars, the regulations proposed by the Bureau place on the shipper the duty of attaching labels and furnish him with definitions for his guidance. It will be the duty of our inspectors to check the performance of this duty by the shipper in conjunction with the check afforded by the general knowledge of station agents. It is manifestly impracticable to require these labels on all packages of the defined articles without recognizing the fact that very small quantities, even of some of the dangerous ones, can be carried without great risk, and without recognizing also the unnecessary hardship of requiring shipments from the retail drug trade and other sources, containing small quantities of inflammable materials, to have labels attached. At the same time a general limit for the maximum quantity that can be transported without a label will not be applicable in all cases, and some elasticity in the regulations is necessary. This has been obtained by the suggestion that the Chief Inspector be permitted to make an examination in any given case and, after consideration of all important factors, to prescribe for the given article, packed in a given way, the maximum quantity that can be received without a label. As in the case of explosives, it is permissible to transport limited quantities, even of labeled packages, without placarding the car. This limit has been placed at 100 lbs. gross weight.

Shipments from storage magazines form a considerable proportion of the explosives transported by the railroads. Concerning them, the report says:

So far as known, no attempt was made before the organization of this Bureau to locate these magazines, and the additional danger attending shipments of explosives offered by them was not thoroughly appreciated. To appreciate it it is only necessary to remember that many explosives are liable to deteriorate with age and at a rate dependent upon the conditions of storage. The shipments offered at factories are usually freshly made and comparatively safe. Shipments offered by magazines may have been stored for indefinite periods and under unfavorable conditions. It is recommended that Article VI. of the Constitution of the Bureau be amended to make storage magazines a basis for assessment.

The inspection service of the Bureau is its most valuable service. An idea of what has been and what is still to be accomplished may be had from the following extract:

In the first assignment of our inspectors one man was placed on duty on some railroad with instructions to make a general inspection of the whole line. These inspections included stations, factories, magazines and cars in transit. Separate blanks were prepared for his report under each head, and he made frequent summaries by letter of his observations, sending copies to the Chief Inspector and to the railroad officials under whose direction he was working. On completion of his general inspection of the entire line, a consolidated report of his observations was prepared in the office of the Chief Inspector and sent to the General Manager of the line for his information, and such action as seemed to him advisable. During this work the inspector acted somewhat as a skirmisher in advance of an army. It was his duty to locate the points where the inspection work of the Bureau is needed and his search for these points was frequently attended by loss of time, especially in sections of the country where train service is infrequent.

The second step in regulating the work of these inspectors, now in progress, is to divide the United States and Canada into 17 districts, assigning each man to a district and requiring him to become familiar, as soon as possible, with the conditions in his district, so that his time can be used to the greatest advantage. This system was started at the beginning of the present year. When an inspector becomes familiar with the points in his district where shipments of explosives originate, and acquainted with the railroad employees connected with these shipments, he will know where his services are needed and he will be able to follow up his in-



inspections to secure correction of violations discovered by him. Experience shows that practically all of the violations of regulations that have been discovered at stations can be included in a comparatively short list of about 16 paragraphs. The blanks have been revised to show these violations and an inspector will have only to check off on the printed list the violations discovered at any station. Under the new system he will leave a copy of this checked list with the railroad agent in order that this agent may not forget the faults to be corrected. Copies will also be sent to the Superintendent, to any other railroad official who may be designated to receive them, and to the Chief Inspector. On subsequent inspection of the station the inspector will call for the previous list of checked violations and will ascertain whether they have been corrected.

With a district covering, in the case of one inspector, over 20,000 miles of railroad line, it is evident that an inspector cannot reach all of the points in these extended districts as often as is desirable. In some sections it is probable that little traffic takes place in explosives, and that the number of points requiring periodical visits from him will not be proportional to the mileage of his district. Until all of these districts are worked over, it will be impracticable for the Chief Inspector to state exactly where his inspectors are needed and how often. As soon as it becomes evident that the points in any one district are too numerous to be checked properly by one inspector, it will be advisable to put another inspector into this district, or to sub-divide it. This will mean an increase in our expenditures. It will be for the members of the Bureau to decide whether these increased expenditures will form a profitable investment.

The volume of inspection work necessary to secure uniform enforcement of regulations is shown by experience to be much larger than was appreciated when the organization of the Bureau was proposed. It was estimated that five or six inspectors might suffice. We now have 17 on duty. The following statements are instructive:

Total number of lines which are members of bureau.....	93
" lines which have received first general inspection.....	32
" " have received partial inspection.....	9
" " are now being generally inspected and not included in above.....	25
Lines assigned to inspectors and which will, as soon as prac- ticable, receive inspection.....	27

Based on data now available, it is estimated that, even with our present membership, the services of our inspectors will be required periodically at 3,000 widely distributed stations, factories and magazines. In 1,663 "one man working days" we have inspected, since August 1, 1907, 1,840 points, an average of over one point per man per day. If we have an inspector visit each point once in three months (see Section 2, Article IV. of by-laws) we shall need, at the above rate, 40 inspectors. With our present force we cannot expect to visit each point once in six months. We are about to issue regulations for the transportation of inflammables, and the volume of this traffic is many times that of explosives. The work of checking the proper use of labels by the shippers of inflammables is essential, and it cannot be done satisfactorily by station agents. Our inspectors should be numerous enough to secure periodical inspection of the packing departments of the large shippers of inflammables, and at least some supervision of the small ones. An increase in our force of inspectors will necessitate increases in our office and laboratory employees to meet the increases in correspondence and in number of samples submitted for analysis.

The questions opened by this glance into the future are serious. The Bureau has undertaken a work of unsuspected magnitude. If it does not secure the financial support required, how shall we decide what to neglect? If our neglect of the larger part of our natural work is evident to all, shall we not be voted a failure, irrespective of any excellence in our limited efforts? The Chief Inspector undertook the organization of the practical work of the Bureau under the impression that the task would be completed within a year, after which he would be free to return to the duties of his profession, and he views the matter now from a standpoint that would be entirely disinterested if it were not for a pardonable pride in his work and a desire, before surrendering this work to a successor, to see the Bureau well established in its field of usefulness. It must, at this critical stage, either advance or recede; it cannot stand still. It has not been forgotten that the executive committee authorized, on October 29, 1907, an increase of our inspecting force to 25. This has not been done because of the strong impression received from the treasurer, and confirmed by correspondence of this office, that a rapid increase in our assessments, while members were in doubt as to the value to them of our work, would seriously endanger the life of the Bureau.

Our records for 1907 show six major accidents from explosives and one large fire from a shipment of inflammable liquid. The total of the known losses was over \$500,000. The value of property destroyed and damages paid do not represent by any means the total loss. We must consider, although we cannot evaluate, the losses to delays in traffic, loss of business and, most of all, loss of confidence and of prestige. To ensure the uniform enforcement of the regulations as adopted, regular inspection of the manner in which they are being enforced is necessary. The promulgation of the regu-

tations, which has been wanting, however, in a few instances, is not by itself sufficient, as has been ascertained, to ensure uniformity or efficiency in their observance. Expert instruction in the requirements of the regulations has been and will be essential, in order that they may be understood and applied in their entirety by the different classes of railroad officials and employees responsible for their execution as well as by the manufacturers and shippers of explosives. Approved methods of handling, loading, etc., must be communicated by the inspectors. Stations at which explosives are received, forwarded or delivered, require inspection in every detail of the requirements for safe transportation. Factories and magazines must be located, their methods ascertained and brought up to the standard of the regulations. Violations of regulations, whether resulting from ignorance or negligence, must be discovered, corrected and provision made against their recurrence. In order to guard against the shipment of explosives in a dangerous condition, either through deterioration or by improper packing, station agents must be instructed in the methods by which deterioration may be known by its evidences, and compliance with the required specifications for the packages must be rigidly insisted upon. It is through the inspectors that the information is communicated, and it is by them that the Bureau is informed as to the observance of the regulations by the different lines.

There are more than 160,000 railroad employees whose duties bring them in contact with the handling of explosives. These men have been found, for the most part, anxious to be instructed and ready to profit by the instructions given them. The difficulties encountered in the construction of the regulations are often cleared up where the reasons for them have been explained. The determination of the condition of shipments of explosives presents little difficulty after the causes of bad condition have been explained, and instruction given as to the evidences of it. In this way knowledge produces confidence, and, at the same time, impresses the necessity for the careful observance of the safeguards prescribed for transportation. That the results obtained in the directions stated are what they are, is a high tribute to the zeal, intelligence and efficiency of the inspectors, the most of whom have acquired their experience in the transportation of explosives since their connection with the Bureau. The wide extent of the field covered by their inspection, the limited number of the inspectors, the organization of the system, literally from the beginning during a period of only seven months, are all to be considered in estimating the value of their work, which is full of the promise of usefulness, enriched by experience, and under conditions of improvement already apparent in many directions. With its present force and necessary increases in clerical and laboratory force, the cost of the Bureau for the year 1908 will be about \$80,000, with 25 inspectors, \$105,000; with 40 inspectors, \$150,000.

In the suggestion for a campaign for the education of railroad employees, the Chief Inspector reports that steps have been taken to have some of the traveling agents of the railroads assist the Bureau in the enforcement of the regulations. These agents are to receive instruction from the Local Inspectors and will be used to aid in the work of the inspectors on the lines on which they are employed. The employees who could assist in this way are Traveling Auditors, Traveling Freight Agents, Traveling Car Agents, Division Agents, Insurance Inspectors, etc. A majority of the membership has approved this suggestion, and has arranged to put it into effect. This will prove in time a valuable auxiliary to the inspection service of the Bureau.

Arrangements are also being made in a preliminary way for representatives of the Bureau to attend as often as practicable meetings of classes of railroad employees to be formed at the railroad branches of the Young Men's Christian Association, for the purpose of studying the general features of explosives and their safe transportation. Popular lectures will be given on these occasions and the opportunity afforded to have the employees ask questions in regard to the regulations and to be fully informed as to the reasons for them. Among the 160,000 railroad employees of this country a large percentage have duties in connection with the transportation and freight traffic departments and thus have to do with the direct handling of dangerous articles. Their education about dangers to be avoided and the way to get greater security for life and property can be thus readily afforded.

The report concludes with the recommendation that the present and prospective conditions be brought forcibly to the attention of the members in order to learn their wishes in regard to the amount they are willing to spend in the support of the Bureau. Assuming financial support, it is recommended that the Chief Inspector be directed to increase the force of inspectors at once to 25, and to make thereafter, during 1908, such further increase, not to exceed 40, as may be necessary to secure; as often as once in three months, a thorough inspection of all factories, and storage magazines, and of all stations on the lines of the members where shipments of explosives are handled.

An interesting exhibit of the territory included in the assignment of the Local Inspectors accompanies the report.

### Freight Tank Engine of the Prussian State Railroads with Schmidt Smoke-Tube Superheater.

The saving in water and coal by the use of highly superheated steam on locomotives is particularly important in tank locomotives, as in this way their radius of action can be considerably increased. The management of the Prussian State Railroads use highly superheated steam on tank engines extensively, having, already, 277 superheated steam tank engines in service and 120 building. One of the most successful types, an 0-10-0 simple engine with Schmidt smoke-tube superheater, is illustrated herewith. This engine was designed and constructed by the Berliner Maschinenbau-Akt.-Ges. vorm. L. Schwartzkopff, of Berlin, with the assistance, and under the supervision, of R. Garbe, of the Prussian State Railroads.

The principal dimensions of the engine are:

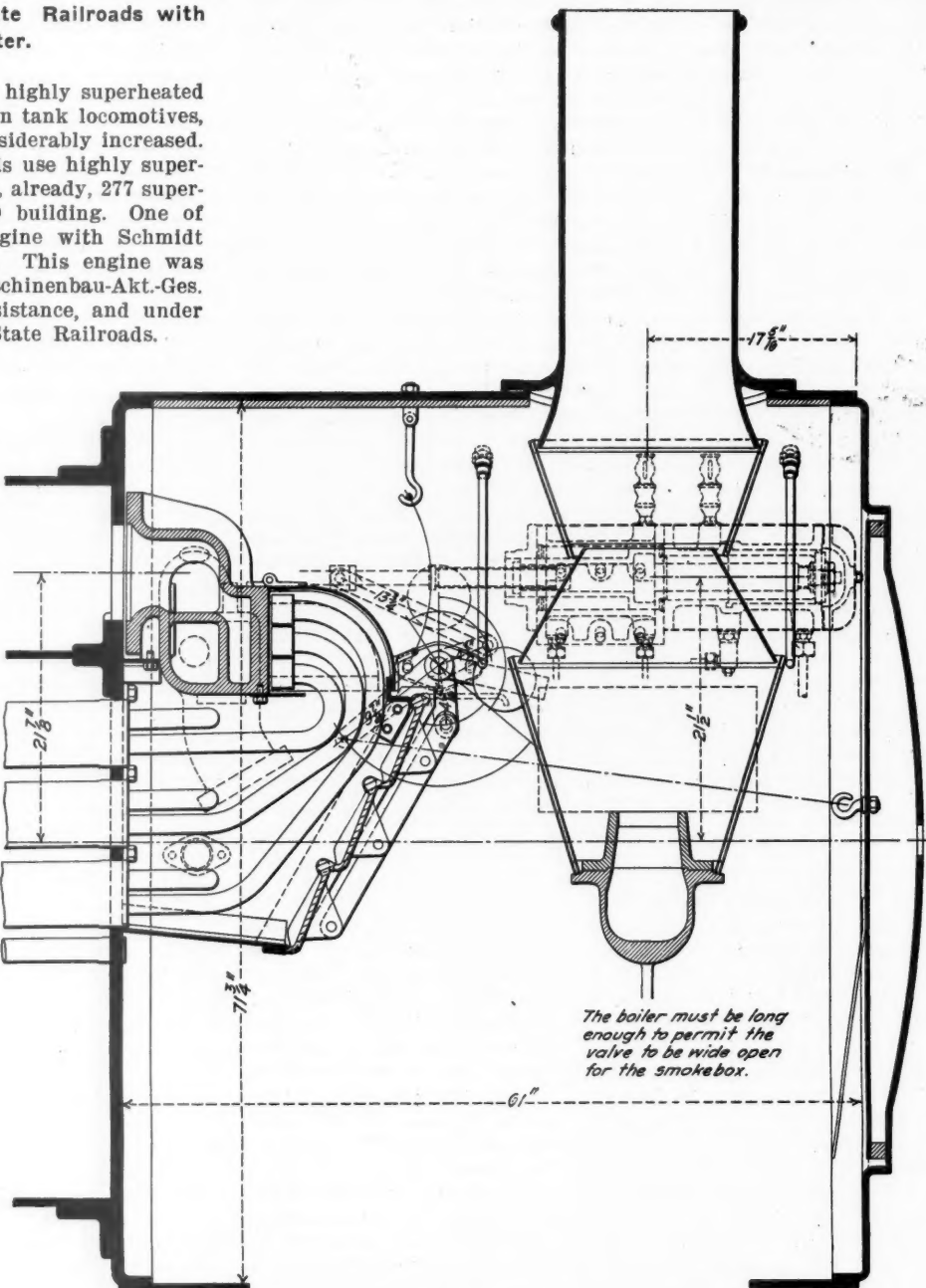
Boiler pressure	170 lbs.
Cylinders, diameter	24 in.
Piston, stroke	26 "
Diameter of drivers	53.2 "
Heating surface, firebox	120.0 sq. ft.
" " tubes	1,332.0 "
" " superheater	458.0 "
" " total	1,910.0 "
Grate area	24.2 "
Weight, empty	129,800 lbs.
Weight in service	162,800 "
Coal capacity	2 tons
Water capacity	2,520 gals.
Tubes, number, 5 1/4 in. diameter	21
Tubes, number, 1 1/2 in. diameter	150
Tubes, length	14 ft. 9 1/2 in.
Tractive effort (American formula)	40,700 lbs.

Weight on drivers	= 4.00
Tractive effort	
Tractive effort x diameter of drivers	= 110.80
Heating surface	
Heating surface	= 78.92
Grate area	
Firebox heating surface	= 6.28*
Total heating surface	
Weight on drivers	= 85.23
Total heating surface	
Volume of 2 cylinders = 13.61 cu. ft.	
Total heating surface	= 140.34
Volume of both cylinders	
Grate area	= 1.76
Volume of both cylinders	
Tube heating surface equated to firebox heating surface (Vaughan formula), sq. ft.	346.00
Total equated firebox heating surface, exclusive of superheater, sq. ft.	= 466.00
Total actual heating surface	= 3.12
Total equated firebox heating surface	

\*Per cent.

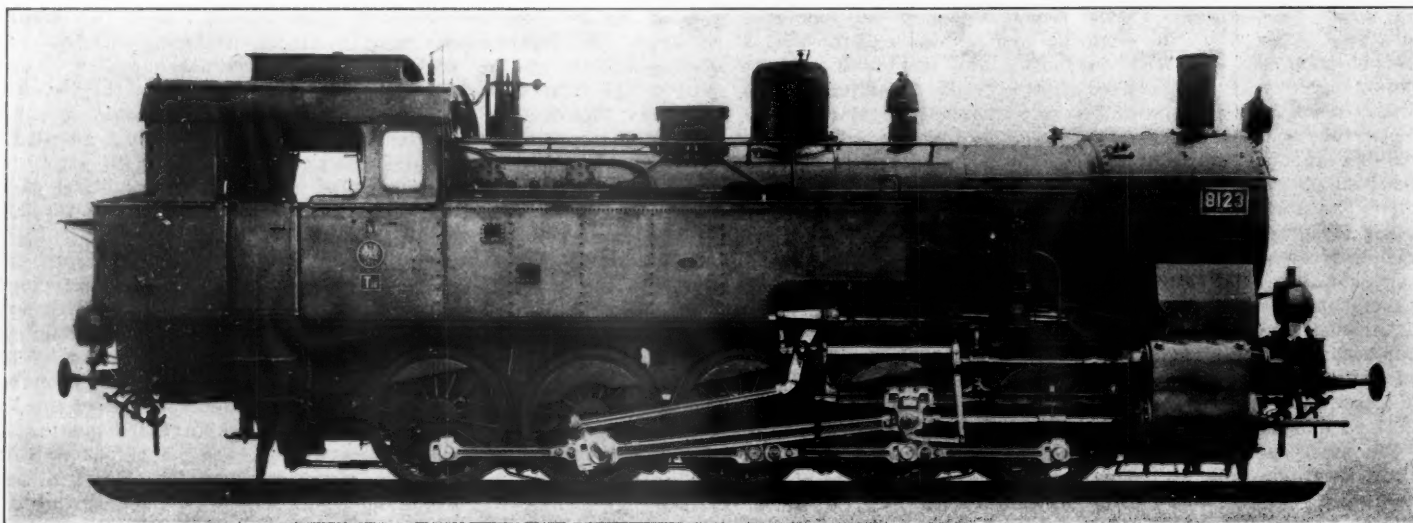
The boiler has, except for the superheating arrangement, no feature of special interest.

The upper part of the boiler barrel is fitted with three rows of large smoke-tubes of 4 3/8 in. inside diameter, this being reduced to 4 in. near the firebox. Inserted in each of these smoke-tubes is a superheating unit, consisting of two sets of pipes, 1 3/16 in. in diameter and 5/32 in. thick, bent in the form of an "U" and connected



Arrangement of Superheater Dampers.

at the smoke-box end to a header, thus forming a continuous double-looped tube. The steam has to pass back and forth through each unit. The double looping of the superheater pipes has the advantage of increasing the velocity of the steam through the tubes, with the result that the temperature of the tubes is lowered, and their life correspondingly increased. The open ends of each unit in the smokebox are expanded into a common flange, which is in-



Tank Locomotive for Freight Service, with Schmidt Smoke-Tube Superheaters; Prussian State Railroads.



dependently secured to the face of the steam collector by a single stud. The stud is centered in the flange and thus makes, with two copper-asbestos rings, an even joint all round.

Most other railroads prefer a different method of arranging

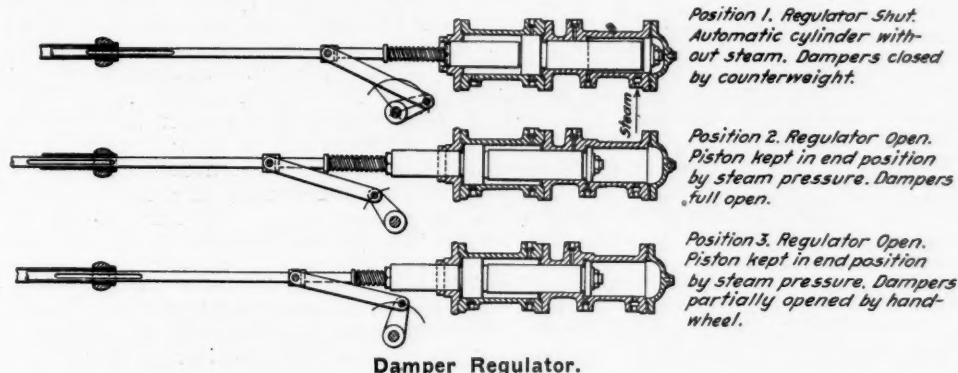
close when the regulator is shut; but as soon as steam is turned on they are opened simultaneously by a piston working in a small steam cylinder which is connected with the valve chest by a small steam pipe. If desired, the superheater dampers can also be worked

by hand from the footplate, so that any desired degree of superheat may be obtained. When open, the dampers allow a clear view through the superheater. The smoke-tubes can be cleaned from soot and ashes by either steam or compressed air with a hose and nozzle, the operation being carried out either from the firebox or from the smokebox. The superheater parts are all interchangeable and accessible. Each unit can be removed without disconnecting the whole arrangement by loosening a single nut.

The engine is designed for heavy mountain service, especially on sharp curves. To get the necessary flexibility without excessive wear of either tires or rails, 1 in. lateral play is given to the first, third and fifth axles; the

second and fourth axles are rigid, the latter being the main driving axle. The piston rod is extended back of the front driver and supported by an intermediate slide bearing; an excessive length of connecting rod is thus avoided.

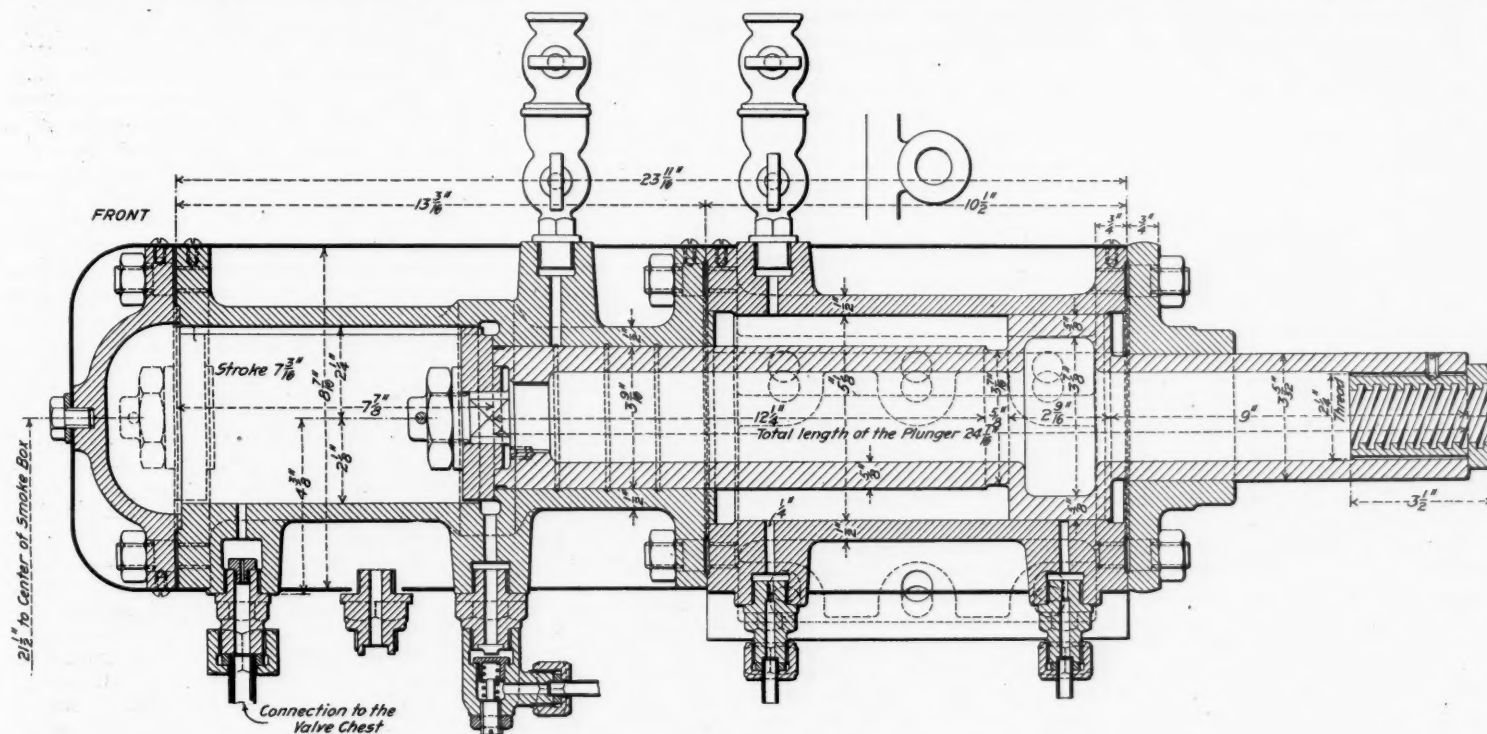
It is a two-cylinder simple engine with Schmidt patent piston valves and a by-pass connecting both cylinder ends. This passage



### Damper Regulator.

the superheater pipe ends in the smokebox. The pipes are bent upwards only, and the flanges are horizontal and fastened by vertical bolts, the heads of which are movable in slots in the bottom of the collector casting.

There are only as many superheater elements as smoke-tubes, i.e., 21 on the engine illustrated and therefore only 21 1-in. bolts



### Automatic Steam Cylinder for Superheater Dampers.

are needed to attach the whole superheating device to the collector casting.

To regulate the amount of superheat and to protect the superheater pipes against overheating while the engine is standing or drifting, dampers are arranged in the smokebox which automatically

is kept closed by a cylindrical cock when the engine is running under steam.

On trials with a 1,515-ton train behind a somewhat lighter engine of this type (67 tons) on an 0.83 per cent. grade, an indicated drawbar pull of 37,000 lbs. at 60 per cent. cut-off was obtained, this giving a factor of adhesion of almost 1:4. Another locomotive of this type has been tested near Erfurt, Germany, on long gradients of 3.33 per cent. and 2 per cent. in the presence of representatives of the most important railroads of France and Belgium.

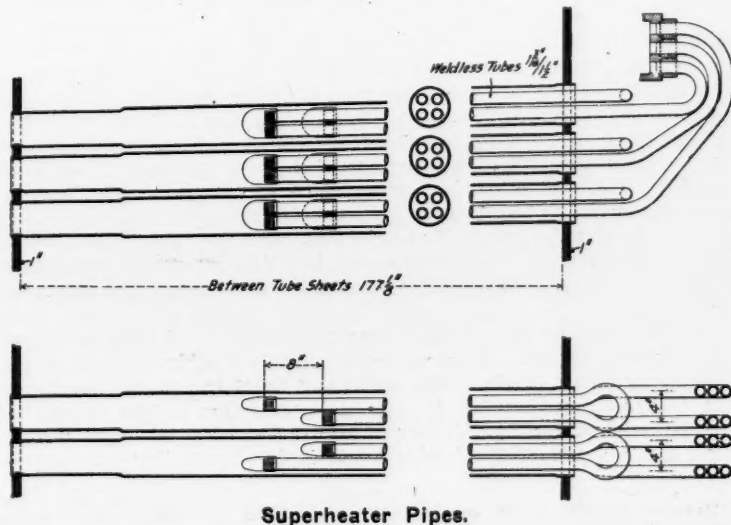
These trials were elaborately described in an article in the *Verkehrstechnische Woche*, 1907, page 1,317, by Mr. Müller, Privy Councillor of the Prussian Ministry of Public Works.

As the engine was being used in regular service, no special trial trains could be made up and therefore the greatest tractive power and highest speed could be demonstrated; nevertheless the results, as indicated in the following table, must be considered exceedingly satisfactorily:

Gradient, per cent. ....	2.00	2.00	2.00	3.33
Length of gradient, miles ....	7.0	7.0	7.0	5.5
Weight of cars, tons ....	400.0	460.0	500.0	282.0
Weight of locomotive, tons ....	72.8	72.8	72.8	72.8
Average speed, miles per hour..	14.3	12.4	10.6	8.1

The graphical records of two of these trial runs are reproduced. Mr. Müller, in his summary of the trials, made the following statements:

- (1) The boiler pressure of 170 lbs. could be easily maintained.
- (2) Superheat of 570 deg. F. was obtained after a few miles run and from 600 to 650 deg. could be maintained with great ease.



### Superheater Pipes.

(3) The valve chest pressure going up hill was 150 lbs. on an average, so that the relative superheat was between 180 deg. and 300 deg.

(4) During the three days trials the engine slipped only once.

(5) The engine is perfectly able to pull without a helping engine 300 tons (55 axles), at 12.5 miles an hour on a gradient of 2.5 per cent. and curves of 650 ft. radius.

Mr. Müller adds that the results obtained with this engine in regular service practically agree with these results of trials. As a consequence, 74 engines of this type have already been put in service on, or are being built for, the Prussian State Railroads. The Paris-Orléans Railroad and the Southern Railroad of France, which were represented at the trials near Erfurt, have already ordered five engines each of this type from a German locomotive builder. The Swedish State Railroads also ordered five of them. In the middle of November, 1907, the total number of Schmidt superheater engines in service or in course of construction amounted to 2,427, representing 78 railroads.

#### The Ocean Carrier.

BY J. RUSSELL SMITH, PH.D.

#### XIV.

##### *Factors Affecting Ocean Line Freight Rates.\**

The last article emphasized the freedom of competition and freedom of action that existed for the advantage of the man or firm who could load an entire ship. There is a radical difference in the rate question facing a man who would ship goods over sea in less than ship load lots. He is necessarily dependent upon some form of co-operative enterprise whereby his small freights may be combined with others. He is the natural meat of the line carrier and he must pay the current rates—the line traffic rates.

Rates in line traffic differ at many points from the full cargo traffic, yet they show the working out of the same principles. Competition is often present and the process of dickering in the bargain for each shipment is common. There is no more uniformity of rate for all the goods on a line steamer at one time than there is for all the many shipments that may fill a train. Valuable goods are charged a high rate and cheap ones a low rate, and different shipments of the same article often have different rates. A line steamer outward bound from an American port usually derives its freight profit from such commodities as machinery and manufactured articles, provisions, oil cake, flour and other prepared food-stuffs. Grain is also usually taken, but at rates that are rarely profitable and always below the full cargo rate for grain. Grain is heavy, but easily handled, because usually handled in bulk, and it makes very desirable ballast to steady the ship. Accordingly the policy is to fill the ship as full as possible with good paying freight and finish her off with grain, some hundreds or thousands of tons, as the case may be. The grain shipper does not especially desire these small irregular shipments. If the European grain market is favorable at all, it is favorable for a shipload of grain, and if the shipper must ship less he will have a concession in rates. This is the more easily obtained because he knows that the shipowner wants it to serve as ballast. Hence it comes about that the line steamers carry a certain and variable amount of grain at lower rates than the tramps.

The variety in rates is further increased by the practice of the managers of some lines to make as many long contracts as possible, sometimes for a year or a season, and secure other freight in advance during a certain month or within a certain week. The year contracts and the month contracts will probably differ in rate, and they are both likely to differ from the rate current at the time of sailing. The last shipments are contracted for in the light of the then existing market conditions, and may be high or low, according to the abundance or scarcity of freight at the time the vessel is finishing her cargo. If freight is scarce the final rate may be lower than the long contract rates, or if abundant the rate may rise. Freight may be shifted from one line to another so easily that it is actively sought. All the companies engaged in the trans-Atlantic trade have agents in the commercial centers like Buffalo, Chicago, St. Louis, and these agents in turn have their local connections. If freight promises to be scarce for a certain scheduled sailing, telegrams will be sent to the inland agents or sometimes a personal representative will be sent from New York, Boston or Philadelphia to Chicago or Minneapolis with power to make such contracts as he finds necessary to secure the freight for the otherwise empty space. So it is that competition dominates also in line traffic in those trades where combination has not relegated it to the limbo of history.

The fact that the steamship line represents an organized busi-

ness gives it a tendency to greater steadiness of rates even in competition than prevails among the chartered vessels, but if fluctuations do not come as quickly they come as surely on routes where there is competition for the work.

As with the tramp, so with the liner—the controlling rate making fact is the fundamental freedom of the open sea, the highway of the nations. With the open roadway of the sea exists freedom of port facilities, and for all line traffic the fundamental rate-governing force is competition in the form of charter rates. If the line rate rises, tramps may flock in and even it up. This was clearly stated by Sir Thomas Sutherland at the sixty-third annual meeting of the stockholders of the Peninsular & Oriental Steamship Company in December, 1903. In commenting on the low rates received that year by the line steamers of his great company, he said:

"But as a matter of fact, it is the world's tonnage at large, the cargo-carrying tonnage of the world at large, which dictates, or rather determines, the current rates of freight both by cargo steamers and by mail steamers, and we are simply dragged into the wake of that great movement, as, I suppose, the great American combine\* has already discovered by this time."

This statement of the influence of the charter vessels upon the rate for line ships is very easily understood by noting the ease with which a considerable share of line traffic may be diverted to charter vessels or charter traffic to line vessels if the gap between the two services becomes too great in one case or too small in the other. Within certain limits the two must rise and fall together.

This influence of charter upon line rates is the wide reaching influence of world rates upon each other. It should not be construed into any statement of similarity of service in general. The tramp competition exerts this influence by taking the line freight at the baser end of the traffic list. It also makes easy the formation of new lines, for the fact should not be overlooked that many freight lines are merely groups of chartered steamers, and if steamers get very cheap, and line rates stay high, there is the great temptation to rush in and get a share of the good things.

Despite this competitive influence line traffic upon the seas presents several distinct contrasts with the charter traffic in the matter of rates and the ease and extent of the competition which has been considered. One of these differences arises because of the size of the unit of competition. In charter traffic the unit is merely a ship, while in the line it is a number of ships—enough to give a rival service. This may include a number of large and expensive ships and an organization of agents on the land to manage and solicit traffic. This fact of the size of the unit is a deterring influence in competition merely because it is easier to do a small thing than a larger one of the same kind.

A second difference is that line competition has an element of vindictiveness, retaliation or penalization unknown in tramp competition. The tramp can cut under the current rates, get a cargo and go without suffering from the direct rate effects of her action, because there is no retaliation possible. If one line goes under the existing rate, it is almost certain that the others must do it also to get their share of the traffic. Then no one is any better off than before; all are worse off from the reduced income, and are ready to punish the party responsible for the loss. Consequently the rate-cut among lines usually leads to a rate war during the continuance of which both parties lose heavily. There is accordingly often a common rate without any formal agreement. No one wants to cut the rate and run the risk of a rate war. This situation thus resembles more closely an armed truce than any other relationship.

A third difference between the competition of the two types of service arises from the irresponsibility of the tramp manager with regard to demoralizing the market. As each bargain is a law unto itself, the manager may demoralize the market by his rate-making and sail his ship away into the great world. Her next contract may be made three months later in the antipodes, and under other conditions, probably little if at all affected by the rate resulting from the manager's last bargain. It is otherwise with the liner, which is practically fixed to a certain route, ordinarily sails from a certain port or series of ports, and comes back again to repeat the same voyage. The line manager who cuts rates must suffer the consequences, because his line continues to move upon the waters he has troubled, and he must do business in that port and must deal with the demoralized rates. The line has customers whose interests must be protected. Shippers, of course, prefer the regularity of the line; and the natural law which makes the tramp irresponsible and the liner responsible forces a certain amount of parallel if not united action among the managers of lines.

The common knowledge among a community of shippers drives to common action. It is necessary and inevitable that all ocean lines competing in the same port know what the others are doing. It is necessary, because if they did not know of the actions of rivals, one carrier, by cutting the rate the smallest shade, would get the lion's share of the business. It is inevitable that they know,

\*In this and the two succeeding numbers the writer has drawn upon two articles published by him, one in the *Political Science Quarterly*, and one in the *Journal of Political Economy*. Acknowledgment is hereby made of the assistance received from the Carnegie Institution, of Washington, in the collection and preparation of materials for this series of articles.

\*A reference to the financial difficulties of the International Mercantile Marine Company, which, despite its great size, had had little or no beneficial effect on rates, to the great surprise and discomfiture of its organizers.



because of the constant search of the shippers and their brokers for cheap rates, and their diligent efforts to get contracts at the lowest possible rates.

Starting with this fact of common knowledge and parallel action among obstinate rivals there is great variety in the stages of mutual action among steamship lines, ranging from rate agreements and division of territory to freight and profit pools. Theoretically, it is easy to control the rates or traffic conditions among ocean lines. All that is needed is that the ocean lines that might compete shall agree on conditions and maintain them. In some trades, this is practised in all its simplicity, but the larger the trade the greater the difficulty, a difficulty amounting in the case of the trans-Atlantic trade to practical impossibility so far as rates are concerned.

This Atlantic situation, which will be presented in a special chapter, is an exception in the carrying trade.

The control of ocean line rates within certain limits by the carriers has been very widespread of late years. It may certainly be called the usual condition of affairs, for it prevails over much the greater part of the surface of the world's great sea. It should be noted that this reference is to the proportion of the ocean's surface, not to the proportion of its trade. The very heaviest trade is not controlled, as are the smaller trades which reach out to the remoter parts of the world.

The ocean steamer has made easier this line rate control, because it has enhanced the superiority of line sailings over independent sailings. In the old sailing vessel days, the superiority of the lines of uncertain packets over the tramp sailer was much slighter than that of the present precise steamer over the occasional rival. The slowness, irregularity and independable quality of the sailing vessel service gave the single ship an equality which it has lost in this day of steamer lines, when the importer is in instantaneous touch with the world through the cable, and knows when to count upon the arrival of the schedule steamer. Thus the importers of the world have become accustomed to an unprecedented speed and regularity in their business dealings which makes them less willing to abide by the service of the tramp, even though it should be a vessel of high efficiency. In its practical working out, this enhanced superiority of the line service over the tramp means that the shipper feels that he must have a line of steamers at his disposal.

Not only is the line service of the present possessed of a greater superiority over the tramp, but the three-fold to six-fold increase of carrying power of the modern steam tramp over its romantic but slow old prototype has limited its use to only the largest firms. The result is that the modern exporter of anything but a few bulky products like grain, ore, coal, oil and lumber is dependent upon the steamship line. This dependence will increase as the trade in manufactured articles increases, and with it the increase in ton value of goods, while at the same time the increase in the size of the tramp ship puts it more and more beyond the reach of the ordinary merchant.

It is easy to see that since it is harder for the individual to compete with the line than it was in earlier days, it is also harder for a line to compete with other lines over long routes than over short routes, for the evident reason that fewer steamers are required to make twelve 3,000-mile voyages than twelve 10,000-mile voyages. If there be added to this the fact that the trade to distant continents is sure to be lighter than to nearby continents, it becomes plain that the first and most natural stronghold of shipping trusts, rings and rate-controlling agreements is in the trade with the antipodes, where, at best, but a few lines suffice to do the work. A few men can agree easier than many men.

It is necessary for ocean carriers who might compete to be in one of four relations to each other: (1) They may be practically independent because they all have more goods than they can carry at profitable rates; (2) they may be active competitors; (3) they may be working under some mutually beneficial agreement with regard to rates or traffic; (4) they may be acting practically as though they had formally agreed, although the condition is only one of mere truce which none cares to break. The last is commonest in the Atlantic traffic where the barriers to agreement are greatest. The first condition—*independence*—is likely sooner or later to lead to the second—*competition*.

There is a peculiar ferocity attending a rate war among ocean line carriers, especially where the number of carriers is small and personal feeling can rise. It is primarily not competition to win trade, but to ruin the rival, to drive him off or bring him to terms. The competition literally hits the rival, whereas it often takes the form, in other enterprises, of being particularly attractive to customer or client. Lines rendering similar service are each acquainted with every move of the competitors, but each hesitates to make the move that starts a rate war, which can only make losses for all carriers and which can end only when one party surrenders or all agree to abide by mutual restrictions that will preserve peace. The element of warfare existing in rate competitions is evidenced by the fact that the competing companies often carry freight at

heavy loss, when a general condition of world-prosperity exists among carriers. Competition causes temporary disregard of all relation between the cost of a ship and income from her. In November, 1902, it was stated that the 10s. rate then prevailing from New York to South Africa involved a loss of \$10,000 to \$15,000 per steamer.

The carriers evidently desire agreements if they can be had, and the shippers do not desire rate wars as much as the lay observer might at first think. During an ocean rate war the rates are chaos, whereas trade thrives on regularity and certainty. The merchant in Cape Town, Buenos Ayres or Shanghai does not relish having in stock a large stock of goods secured at a normal rate and suddenly find his rival getting the same goods in at a much lower cut rate. The constant fluctuations of a rate war often cause neighboring merchants to receive the same kind of goods by the same ship at different rates. One of them blames somebody, usually the export commission merchant, and he in turn blames his freight broker. It is no unusual practice for an importer to divide an order among several export commission men. If the goods come on the same vessel at different rates as they very likely may, he is dissatisfied. The irregularity and wildly fluctuating rates would make it difficult for the importer to calculate a "laying down" cost of goods without expensive telegraphing. An editorial in a shipping journal, defending European shipping agreements to control rates to the Orient, declares that "competition now based on careful lines would" (under conditions of non-agreement) "resolve itself into as hazardous a speculation as a chance in a lottery."\*

Another thing unfavorable to the shipper is the common irregularity of sailing schedules in a rate war. The ships are managed, not to please the shipper, but to injure the rival, and with that object the sailing days are often made nearly to coincide. This does not give opportunity for an even flow of freight. The shippers prefer an even schedule, a rate as constant as possible, and the same for all shippers. These conditions are difficult to secure where lines do not agree.

The rate war sometimes disturbs distant trades, as when a quarrel among London owners in the United Kingdom-Australian trade is carried to New York-Australian trade where these same owners run steamers—an episode that occurred in 1905.

The combined result of all these influences is, that with the partial exception of the north Atlantic freight, there is in ocean line trades, both great and small, a normal condition of agreement among line carriers. This is disturbed by the frequent competitions that precede and end the agreements. The agreements are evidenced by the much greater constancy of line rates than of charter rates. These agreements are often reported in various journals, in consular reports, and in annual reports in the companies themselves. The annual report of the United Companies of Copenhagen (*Forenede Dampskibsselskab*) for 1904, stated, "that the continental lines in their war against the Cunard Line unfortunately chose territory of the Danish Company and cost it a round million. Peace was concluded in December, and the company made a friendly working agreement with the competing companies, so that the future in this territory may be looked upon with full confidence."

The 1903 report of the Kosmos Line, plying between Hamburg and the Pacific coast of both Americas, after stating that a combination of sailing-ship owners had helped the line by stiffening and steadying rates on Chilean nitrate, discussed in an annex to the report the announcement of a Hamburg firm's intention to run monthly sailings of English vessels from Antwerp to western South America. The Kosmos directors did not fear from this any successful encroachment upon their business. This would be prevented by the convention concluded a few years previously with the Hamburg-American Company and by the extensive system of rebates that had been established. Mr. Ellerman, one of the men who sold out to the International Mercantile Marine Company and afterward went into other shipping enterprises, told the stockholders of the Ellerman lines in annual meeting that six lines had recently been bought by the new company, and that in most cases there were working agreements with the other lines engaged in those trades. Sir Thomas Sutherland, chairman of the Peninsular & Oriental Company, told the stockholders in a recent annual meeting that his company was a party to conferences or working agreements with various lines rendering the same services, and that such had long been the common custom of shipping lines in nearly all trades.

The same forces that have produced these agreements have also driven to consolidation throughout the world, and made the carrying corporations grow, line upon line, service upon service. It has not been limited to the north Atlantic. Practically all of the German lines going to South America are consolidated or closely allied, so are also the German lines to East Asia. The North German Lloyd has recently bought out a Scotch and a German line that competed in the East Indies adjacent to Singapore. The two leading British South African lines have consolidated; a host of

\*Fairplay, July 31, 1902, p. 162.

small Danish lines have formed the United Companies of Copenhagen and the several long-struggling coasting lines of Finland have done the same thing. With the development of the telegraph, the simplification of direction and the reduction of number of owners, agreements become easier.

(To be continued.)

#### The Baltimore & Ohio's New Eastbound Freight Yard at Brunswick, Maryland.

The Baltimore & Ohio has recently opened a new classification yard for eastbound freight at Brunswick, Md., on the main line about 80 miles west of Baltimore. This yard is  $3\frac{1}{2}$  miles long, has a capacity of 3,960 cars and extends from Knoxville, on the west, to East Brunswick, on the east, where it connects with the old 2,500-car yard at Brunswick, which extends  $2\frac{1}{2}$  miles still further east. The total length, therefore, of the combined yards at Brunswick is six miles and the total capacity 6,460 cars.

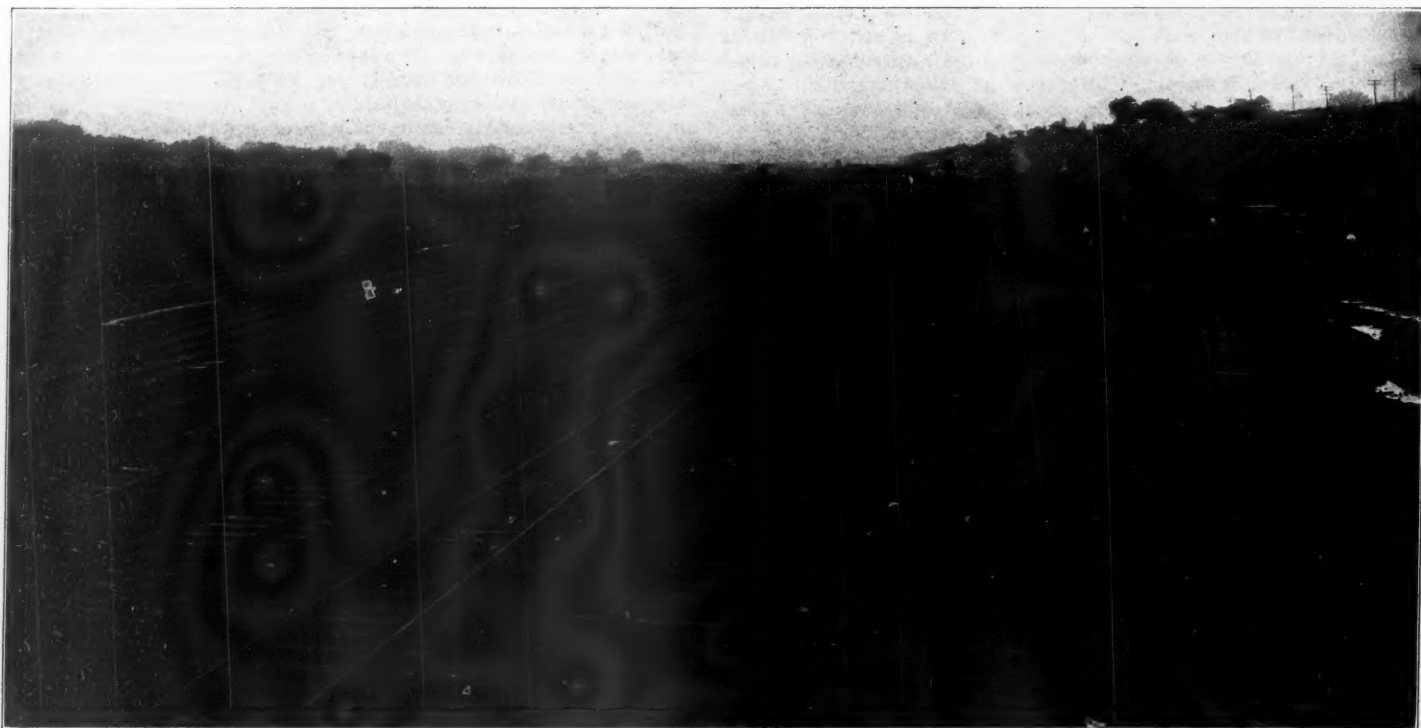
The old yard at Brunswick, which has always been a classification point for both eastbound and westbound freight, was put in operation in 1891. The great increase in traffic during the last two or three years has made it necessary to more than double the yard facilities. The new yard is to be used entirely for eastbound freight and the old yard only for westbound business. The two yards together form, according to the Baltimore & Ohio officers, the largest individual freight terminal in the country.

Work on the new eastbound yard was begun in August, 1906,

cut and concrete flumes have been built up the sides of the slope at the various ravines where the water flows down to the yard. Through them the water is carried down to cast-iron pipes running under the yard and the canal on the south side of the yard. These flumes prevent the wash of the water from destroying the slopes.

Brunswick is the eastern terminal of the Cumberland division and the western terminal of the Baltimore division. It is 102 miles east of Cumberland, W. Va., and 75 miles west of Baltimore, Md. All cars classified at Brunswick go through east to destination. Freight trains arriving at Brunswick from points west enter the new yard at Knoxville, the western end of the terminal, by a No. 20 turnout. The receiving yard has 16 tracks with a capacity of 66 cars each, or a total of 1,052 cars. It is reached by two outside ladders, one having eight switches, the other seven. On entering the receiving yard the caboose is cut off from the train. The caboose track turns off by a No. 16 turnout and the caboose is run by gravity around the receiving yard on the south. At the eastern end of the receiving yard it is picked up by the engine and run to the engine house by the engine track which runs to the south of classification yard. The western half of the receiving yard is on a  $1\frac{1}{2}$  deg. curve and the east half is tangent.

The outlet of the receiving yard is by two inside ladders each containing seven switches. Cars from this yard are pushed up on a hump which is  $14\frac{1}{2}$  ft. above the entrance and 12 ft. 5 in. above the general yard level of the receiving yard. Cars from the north half of the receiving yard reach the hump track by a No. 10 crossover connecting the two ladders, the south ladder leading directly over the hump. The grades leading to the hump are



New Eastbound Classification Yard at Brunswick, Maryland; Baltimore & Ohio.

and finished in October, 1907, which is fast time for so large a piece of work. During these 14 months 900,000 cu. yds. of earth were removed, 3,000 cu. yds. of monolithic and 200,000 cu. yds. of concrete culverts built and 875 tons of cast-iron drain pipe laid.

The first work was to divert the old main tracks, which roughly bisected the new yard site, to temporary tracks around the south side of the yard. Since the excavation and embankment were about equal these were built on embankment on the permanent location of the eastbound passenger and freight tracks. This diversion was completed on December 1, 1906, and gave the contractor control, free from interference from trains, of the whole territory on which he was to work. The grade contour closely followed the location of the old tracks for a little over two miles. Two 70-ton Bucyrus steam shovels and two model A Marion steam shovels were put on this section and 12 locomotives and 160 dump cars were used in moving the material from the shovels. Star well-drilling machines were used to drill in advance of the shovels, the holes usually going to subgrade before being shot down to the shovel. There were 16 miles of narrow gage track laid to reach the various dumps. By January 1, 1907, the contractor had sufficient area graded to allow the company to begin tracklaying, which was carried on without interruption until all the track in the new yard was laid.

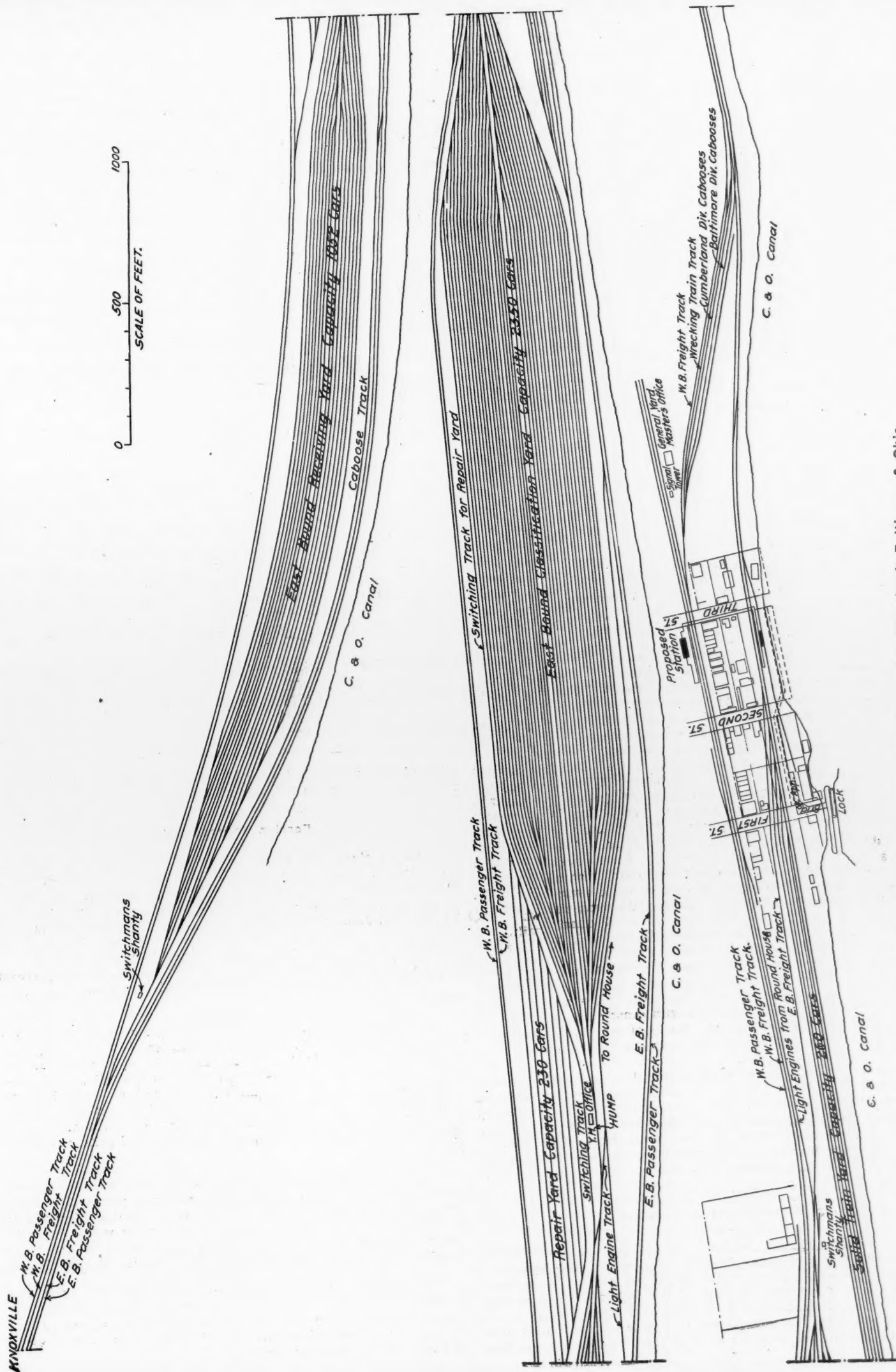
The slopes along the whole north side of the yard are  $1\frac{1}{2}$  to 1. The surface ditch runs the whole length of the yard on top of the

3,600 ft. of 0.25 per cent., 1,050 ft. of level and 550 ft. through the south ladder of 1 per cent. grade. Pushers are used only on the hump grade. A road engine can pull a 65-car train into the yard without help.

The descent from the hump starts with 100 ft. of  $3\frac{1}{2}$  per cent. grade, then 1,000 ft. of 1 per cent. grade through the classification yard ladders and 0.3 per cent. grades through the classification yards. The hump is  $22\frac{1}{2}$  ft. above the eastern end of the classification yard.

The eastbound classification yard has 36 tracks, 18 on the north and 18 on the south side, each with a capacity of 65 cars, or a total of 2,340 cars. It is set by two double ladders operated by an electro-pneumatic push button machine. Each ladder has nine switches. As the cars come from the receiving yard to the hump they are tagged by the brakeman which indicates to the switchman working the push button machine for which track they are bound. For example, if a train pulls into the receiving yard with the first 10 cars for Washington and the next 20 for Baltimore, a tag reading "10-4" is put on the front of the first 10 cars, indicating that there are 10 cars in the shift to go on the Washington track in the classification yard. The next 20 would be tagged in a similar way for Baltimore. The outlet from the classification yard is by double ladders through the center of the yard and a single ladder on each side, each ladder having nine switches. Trains from the northern half of the classification yard pull direct-





New Eastbound Yard System at Brunswick, Maryland; Baltimore & Ohio.

ly out on the eastbound freight track. Trains from the south half of the classification yard pull out on this track by a No. 10 turnout. The eastbound freight track runs along the north side of the solid train yard. The eastern end of this yard is joined to this track by a No. 16 turnout.

Through freight trains from the West run on a through track on the south of both the receiving yard and the classification yard and enter the solid train yard at a point southeast of the eastern end of the classification yard. The solid train yard has a capacity of 260 cars. Here the through trains are held while they are being inspected and changes of crews and engines made. The eastbound freight track is connected with the solid train yard at each end by a single ladder. In the receiving, classification and solid train yards No. 8 slide-wing frogs are used.

The repair yard is between the receiving yard and the classification yard on the north and opposite the hump. It consists of seven tracks spaced 25 ft. between centers and has a capacity of 230 cars. It is connected with the east end of the receiving yard. On the south of the repair yard is a switching track which is connected with the two ladders of the receiving yard and at its western end with the westbound freight tracks. By this, cars can be taken directly from the receiving yard or from the classification yard to the repair yard without fouling the tracks.

The old yard is located just east of Brunswick. It has 55 tracks, each with a capacity of 40 cars, or a total capacity of 2,200 cars. The increase in the train unit in the new over the old yard from 40 to 65 cars is notable as indicating the heavier train loads and consequent changes in yard design of 1907 over 1891. Now that the new eastbound yard has been finished, the old yard is used entirely as a westbound yard. The entrance to the old yard is at East Brunswick, where an interlocking tower is to be built. The exit is at West Brunswick, and is also controlled by an interlocking tower. At the western end of the yard are the worktrain track, the Cumberland division caboose track, the Baltimore division caboose track, and a coach track on which passenger cars are stored for local trains made up at Brunswick.

There are four main tracks running around the two yards from Weverton, which is one mile west of the western end of the eastbound receiving yard at Knoxville, to East Brunswick. A westbound passenger track and a westbound freight track run on the north side of the yards, and an eastbound passenger track and an eastbound freight track on the south side. There is an interlocking tower at Weverton governing the ends of this four-track system.

At Brunswick, between the eastbound and the westbound yards, is the office building for the Assistant Trainmaster, the General Yardmaster and the telegraph office. The building at the hump is 21 ft. x 34 ft., and is for the Trainmaster and the Assistant Yardmaster, who have offices on the first floor. The push-button machine is on the second floor and the compressor and batteries are in the cellar. The yard is lighted by electric arc lights, the line of which runs directly through the center of the yard where the tracks are spaced 18 ft. centers. The eastern end of the receiving yard, the double ladders, and both ends of the classification yard also have 18 ft. centers. The tracks are all laid with 85-lb. rail and cinder ballast, except the main tracks, which are laid with stone ballast. In accordance with the Baltimore & Ohio's policy of beautifying the right-of-way, the sloping elevation of the new yard has been sown with grass seed. As the yard is some feet higher than the main tracks which run around it, it will have the appearance from the passenger trains of the sides of a large banked flower bed.

The cost of the new eastbound classification yard, which covers 115 acres and contains 12 miles of main tracks and 40 miles of yard tracks, was \$1,000,000. The contractors were F. H. Clement & Company, of Philadelphia, and the yard was built under the direction of the following officers of the Baltimore & Ohio: D. D. Carothers, Chief Engineer; A. M. Kinsman, Engineer of Construction, and J. T. Wilson, Assistant Engineer.

#### Passenger Rates in Russia.

The Russian Finance Minister reports that an investigation of the effects of the passenger tariff of 1894, which made extremely low rates for long distances, shows that it has had a very unfavorable influence on the net earnings of the railroads. The number of passengers carried has increased under this tariff from 44 to 103 millions, or 134 per cent., partly due to a large increase in the mileage of railroads; and even per mile of road the increase has been

38 per cent. Meanwhile the gross passenger earnings have increased about \$30,000,000, and the expenses due to this traffic about \$32,000,000, so that the net passenger earnings have decreased from \$8,670,000 to \$6,656,000. The much larger mileage has of course involved a much larger increase in capital. Taking in consideration the interest on the investment, the Russian passenger traffic nets a loss every year. The ministry estimates this loss to have been \$7,530,000 even in 1894, rising to \$24,355,000 in 1904. He proposes a new passenger tariff, which for distances of 200 miles and less would be slight for the third class, but considerable for the greater distances, and for the two higher classes large—for 265 miles 28½ per cent. for the second and 32 per cent. for the first class. The changes were still under discussion in January; but there seemed to be no opposition to an advance of some kind.

#### Pay of American Railroad Employees.

The report of the Interstate Commerce Commission for the year ended June 30, 1906 (full report just issued) gives the following

Class.	United States.										
	1906.	1905.	1904.	1903.	1902.	1901.	1900.	1899.	1898.	1897.	1896.
General officers.....	11.81	11.74	11.61	11.27	11.17	10.97	10.45	10.03	9.73	9.54	9.19
Other officers.....	5.82	6.02	6.07	5.76	5.60	5.56	5.22	5.18	5.21	5.12	5.96
General office clerks.....	2.24	2.24	2.22	2.21	2.18	2.19	2.19	2.20	2.25	2.18	2.21
Station agents.....	1.94	1.93	1.93	1.87	1.80	1.77	1.75	1.74	1.73	1.73	1.73
Other station men.....	1.69	1.71	1.69	1.64	1.61	1.59	1.60	1.60	1.61	1.62	1.62
Enginemen.....	4.12	4.12	4.10	4.01	3.84	3.78	3.75	3.72	3.72	3.65	3.65
Firemen.....	2.42	2.38	2.35	2.28	2.20	2.16	2.14	2.10	2.09	2.05	2.06
Conductors.....	3.51	3.50	3.50	3.38	3.21	3.17	3.17	3.13	3.13	3.07	3.05
Other trainmen.....	2.35	2.31	2.27	2.17	2.04	2.00	1.96	1.94	1.95	1.90	1.90
Machinists.....	2.69	2.65	2.61	2.50	2.36	2.32	2.30	2.29	2.28	2.23	2.26
Carpenters.....	2.28	2.25	2.26	2.19	2.08	2.06	2.04	2.03	2.02	2.01	2.03
Other shopmen.....	1.92	1.92	1.91	1.86	1.78	1.75	1.73	1.72	1.70	1.71	1.69
Section foremen.....	1.80	1.79	1.78	1.78	1.72	1.71	1.68	1.68	1.69	1.70	1.70
Other trackmen.....	1.36	1.32	1.33	1.31	1.25	1.23	1.22	1.18	1.16	1.16	1.17
Switch tenders, crossing tenders, and watchmen.	1.80	1.79	1.77	1.76	1.77	1.74	1.80	1.77	1.74	1.72	1.74
Telegraph operators and dispatchers.	2.13	2.19	2.15	2.08	2.01	1.98	1.96	1.93	1.92	1.90	1.93
Employees—account floating equipment.	2.10	2.17	2.17	2.11	2.00	1.97	1.92	1.89	1.89	1.86	1.94
All other employees and laborers.	1.83	1.83	1.82	1.77	1.71	1.69	1.71	1.68	1.67	1.64	1.65

table of the average daily pay of railroad employees for the years 1896-1906. The figures indicate dollars and cents.

#### Foreign Railroad Notes.

Though there has been a noticeable slackening in business activity in Germany since October, traffic has kept up much better there than here. In December, the orders for open cars were nearly 11 per cent. greater than in 1906, and even for box cars they were 3.8 per cent. greater. There has been something like a coal famine, which partly accounts for this. The gross earnings of all German railroads in December, 1907, were 2 per cent. greater from freight and a trifle greater from passenger than in 1906. For the previous months of the year the freight earnings had been about 5 per cent. greater.

Further evidence of the industrial progress of Germany is given by its coal consumption, which increased nearly 40 per cent. from 1902 to 1907—from 163,663,000 to 228,984,000 short tons, and per head of population from 2.784 to 3.695 tons annually. There are considerable exports of German coal, but these are usually balanced by the imports. In 1907, the imports exceeded the exports. In that year the coal consumption was 9 per cent. greater than in 1906. More than a third of the consumption in 1907 was lignite, an inferior fuel.

During the year 1907 the additions to the Russian railroad system amounted to 1,167 miles, an increase of 3 per cent., bringing up the total to 40,438 miles. Of the whole mileage 67 per cent. belongs to the state. At the end of the year there were 1,600 miles under construction, included in which is a branch of the trans-Caspian line (Asiatic Midland), 118 miles, to the Persian border.

The new Italian passenger rates, which went into effect Nov. 1, 1906, made large reductions in the rates for long distances. The result has been for the first year an increase of 18 per cent. in journeys of more than 150 kilometers (93 miles), and an increase of 12.3 per cent. in passenger earnings.



# GENERAL NEWS SECTION

## NOTES.

The Missouri, Kansas & Texas shops at Sedalia, Mo., have been reopened with a force of 500 men.

Announcement is made that the Birmingham extension of the Illinois Central will be opened April 19.

The Canadian House of Commons has passed a resolution declaring that the time has arrived for building a railroad to Fort Churchill on Hudson bay.

The Wabash discontinued passenger traffic over its Pittsburgh West Side Belt line on April 4. An attempt to do the same thing was made two years ago but was given up.

Judge Lacombe, of the United States Circuit Court, has permitted the receivers of certain portions of the New York City Railway Co. to reduce materially the transfer privilege.

The brake-beam of an engine pulling out of the El Paso, Tex., yards dropped and wrecked the train. One of the five cars derailed was loaded with dynamite, but nothing happened.

The up-state New York Public Service Commission has denied the right of the New Haven to abandon 16 miles of the Central New England, which parallels the Poughkeepsie & Eastern.

The Canadian Society of Civil Engineers is urging upon the Canadian government the desirability of appointing a practical railroad engineer on the Board of Railway Commissioners.

A vote has been taken by employees of the Boston & Maine on the 5 per cent. reduction in wages proposed by President Tuttle, and the employees have declined to accept the reduction.

The Chapman & Dewey Lumber Co., of Kansas City, pleaded guilty on March 30 to the charge of having accepted rebates from the St. Louis & San Francisco and was fined \$13,000 and costs.

A committee of the New York Assembly, on April 3, reported favorably a bill amending the New York City Rapid Transit law so that private capital can be interested in building new subways.

On March 31 Judge McPherson, in the federal court at Kansas City, held that the state officers can be enjoined from enforcing the Missouri 2-cent law if it is found to be unremunerative to the railroads.

The Oklahoma Corporation Commission has issued an order reducing express rates in Oklahoma about 40 per cent. Before this order goes into effect a hearing will be granted to all parties concerned.

On March 1, J. R. George was retired and placed on the pension list of the Lackawanna. Mr. George has been with the company 42 years and has been conductor on the same train for 32 years and 2 months.

The General Passenger Agent of the New York, Chicago & St. Louis announces that colonist tickets will be honored as first-class tickets from all points on that road to Chicago and will be accepted in Pullman cars.

At a meeting of the Kentucky Railroad Commission, April 3, attorneys for all railroads operating in the state made a motion that the Commission rescind its order of two years ago for a general reduction in freight rates.

On April 19 the New York Central will restore the 18-hour schedule between Chicago and New York for the Twentieth Century Limited. This schedule was temporarily abandoned last December, when one hour was added to the running time.

J. W. Midgley announces that the Railway Clearing House Bureau, of which he has been manager, has completed its seventh year and has gone out of existence. The bureau was supported by 18 railroads and by the banking house of J. P. Morgan & Co.

The chairman and engineer of the Texas Railroad Commission have recently completed their inspection of the 600-mile section of the Southern Pacific between El Paso and San Antonio, and are quoted as saying that this stretch of track is the finest in the Southwest.

President Roosevelt has made public a letter to Attorney-General Bonaparte directing proceedings by injunction to compel certain southern railroads to furnish colored passengers with as good accommodations as those furnished white passengers for the same money.

The Texas Health Department has accumulated some 2,000 cases against the Pullman Co. for alleged violation of the state health laws adopted a year ago, requiring fumigation of all sleep-

ing cars at the end of each division and other extraordinary precautions.

The arbiters in the Southern Railway wage matter have reached an agreement by which the present wage scale for all organizations shall be continued until the first of July, with the understanding that if by that time the conditions shall not have improved the negotiations shall be resumed.

On April 3 the Senate Committee on Interstate Commerce, with the approval of the Interstate Commerce Commission, agreed to report favorably Senator Elkins' resolution extending the time for the application of penalties for violation of the commodity clause of the rate law until January 1, 1910.

The Massachusetts legislative committee on railroads on April 7 reported favorably on a bill accompanying a petition of the New York, New Haven & Hartford for the consolidation of the Milford & Woonsocket Railroad and the Milford, Franklin & Providence Railroad with the New England Railroad.

The New York, New Haven & Hartford is installing a fourth generating unit at the Cos Cob power station. Electric operation from Stamford to New York has been extended to include some of the through expresses; in all, 83 trains on week days and 33 on Sundays are now hauled over this section by electric locomotives.

Following a Supreme Court decision the Georgia Railroad will have to pay to the state of Georgia, to the city of Augusta and to Richmond county \$335,000 in back taxes. The property upon which the taxes were claimed was 15,000 shares of Western Railway of Alabama stock, and the case has been in litigation for some six years.

Following the decision of Illinois railroads to test the constitutionality of the 2-cent passenger law in the state, George T. Nicholson, Third Vice-President of the Atchison, Topeka & Santa Fe; P. S. Eustis, Passenger Traffic Manager of the Burlington, and A. H. Hanson, Passenger Traffic Manager of the Illinois Central, have been appointed to manage the campaign.

The federal receiver of the International & Great Northern has been notified by the Texas Railroad Commission that he must invest every dollar of income of the property over actual operating expenses and fixed charges in making improvements ordered by the Commission prior to the receivership. Failure to obey will result in suit for forfeiture of the company's charter.

The threatened strike of the shopmen on the New York, New Haven & Hartford has been averted by an agreement on the part of the management not to enforce its order of March 10 extending the piece work system. Piece work will continue where it has been in operation, and as discharged men are re-employed the piece work plan will be extended gradually, but no radical change will be made.

The Missouri Supreme Court has denied Attorney-General Hadley's motion for the appointment of a commissioner to take testimony in his ouster suit against the Missouri Pacific, the Wabash and the Iron Mountain railroads; the Pacific Express Co., the Rich Hill Coal & Mining Co., and the Kansas & Missouri Elevator Co. for alleged violation of the state anti-trust laws. The case is set for argument in the April term.

The General Managers' Association has published figures showing that approximately 345,000 fewer employees are working for railroads in the United States than were working October 1, 1907. These statistics include actual figures of employees discharged by 17 roads having a mileage of 71,782. On these roads the decrease in employees amounted to 18 per cent. There is a lesson in these figures for people who make it difficult for the railroads to reduce wages.

The Great Northern was found guilty in the United States Circuit Court, April 7, of having paid rebates to the American Sugar Refining Co. in 1904 in violation of the Elkins Act, and was fined \$5,000. The United States District Attorney called the court's attention to the fact that the transactions on the part of the railroad company did not involve to the same extent elements of fraudulent concealment as were disclosed in certain prior cases. In the case of the Great Northern the rebates had been entered in the regular books.

Chicago bankers have sent out a notice that after April 15 they will refuse to make advances against the usual "order" bill of lading containing the "care consignee" clause covering shipments of grain by lake, because this grain is delivered without surrender of the bill of lading. Trunk lines will be requested to discontinue forwarding lake grain without the surrender of the western carrier's bill of lading and in the meantime the Chicago banks are ex-

pected to suspend their notice until further consideration has been given the matter by a standing committee which has been formed.

Representative Esch, of Wisconsin, introduced a bill April 6, providing that no interstate railroad should, after it had been in operation for one year, issue any additional stocks, bonds or other instruments of indebtedness except when necessary for the acquisition of property, the extension or improvement of its lines and facilities, and the improvement and maintenance of its service. The bill forbids payment of dividends in anything but cash and the acquirement of control or interest in any other railroad corporation, except to establish, by consolidation of connecting lines, through transportation routes.

#### White Portland Cement.

Figures on two recent tests of White Portland cement are given below. These tests were made respectively by Robt. W. Hunt & Co., Chicago, and Henry S. Spackman Engineering Co., Philadelphia. In the former the sample showed a fineness through a No. 100 sieve of 95.56 and through a No. 200 sieve of 79.54. Initial set occurred in six hours and final set in 7 hrs. 5 min. The tensile strength for neat briquettes averaged at the end of 24 hrs. 368 lbs.; seven days, 710 lbs., and 28 days, 940 lbs.; the corresponding figures for a 1:3 mixture were 168, 223 and 310 lbs. respectively.

The second set of tests showed figures approximately the same as the foregoing as regards tensile strength and fineness. In addition there were constancy of volume tests which were all marked "good," steam and boiling water tests marked likewise, and a chemical analysis as follows, the figures being percentages: Silica, 25.1; alumina, 5.05; iron oxide, 0.43; lime, 65.68; magnesia, 1.54; sulphur anhydride, 0.96; loss on ignition, 1.24. It is also stated that this cement passes the specifications adopted by the American Society for Testing Materials.

It is claimed that this cement, which is of pure white color, will be found suitable for building ornamentation, concrete building blocks, interior decoration work, colored concrete, stainless mortar, and tile, mosaic, seats, railings, gateways, etc. It is made by the Sandusky Portland Cement Co., Sandusky, Ohio, a special factory having been built for its production at York, Pa.

#### Harriman Lines Reply to Government Suit.

The answers of the defendants in the suit of the United States to dissolve the Harriman system of railroads on the ground that the system is a monopoly in restraint of trade, were filed in the federal court at Salt Lake, Utah, April 6. Mr. Harriman denies in his answer that he with Jacob H. Schiff, Otto H. Kahn, James Stillman or others has owned or controlled a majority of the stock of the Union Pacific Railroad. He denies that the firm of Kuhn, Loeb & Co. was a fiscal agent of the Union Pacific Railroad. He denies that he and the other defendants conspired to restrain trade among the several states or foreign countries, to restrain competition among the defendants' steamship and railroad lines or to deprive the public of the advantages of trade and commerce through independent combination, if there was any such, or to effect a consolidation with the idea of monopoly, or restraining trade and commerce, admitting, however, that the Union Pacific acquired a majority of the capital stock of the various lines and steamship companies. He denies in each instance that acquisition of the stock was to kill competition or to monopolize trade, commerce or business. He denies that the Union Pacific has control in management of operation of the affiliated lines. He avers that in the transcontinental lines of railroads reaching the Pacific coast, south of Portland, the Union Pacific is but a link about 1,000 miles long, an intermediate carrier without any power to make rates on such traffic; that the Southern Pacific owns and controls lines between Ogden and the coast with no power to make rates for business east of Ogden; that no rates could be made from the Missouri river to the coast without the joint consent of the Southern Pacific and the Union Pacific; that, while the Union Pacific and its constituent companies separately owned connecting lines (operated as a single system from the Missouri river to Portland, Ore., and operated certain small steamships between Portland and San Francisco), yet such a route, via Portland, was not only impracticable as a competitor of the Southern Pacific, but any attempt to use it would have greatly injured the Union Pacific, because the Southern Pacific would thereupon have preferred the rivals of the Union Pacific in routing and interchanging traffic at Ogden, and the business in tonnage and revenue thus lost would have greatly exceeded the total volume of business received over such an impracticable route in competition with the Southern Pacific.

Mr. Harriman denies that the rail line of the Southern Pacific between San Francisco and Portland is in active competition with the ships of the Oregon Railroad & Navigation Company between the two cities, and explains that such competition is impracticable.

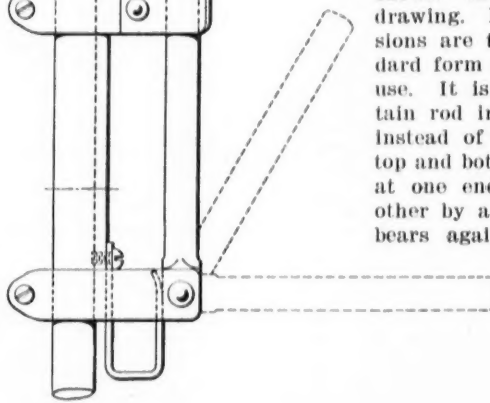
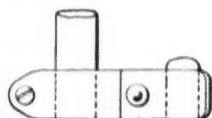
He denies that ships operated by the Portland & Asiatic Steamship Company between Portland and Asiatic ports, and con-

nected with the rail lines of the Union Pacific, were ever in competition with the Pacific Mail Steamship Company. He denies that any competition ever existed between the system of railroads and steamships owned by the Union Pacific Railroad Company and the Southern Pacific, or, if any such competition did ever exist, it was not substantial, or did not include a large volume of traffic of any kind.

He admits that the Union Pacific, in connection with the Central Pacific, is a competitor of the Atchison, Topeka & Santa Fe for a large volume of traffic to and from the Pacific Coast.

#### Self-Opening Handle for Vestibule Curtains.

There is considerable loss on all roads from the tearing of vestibule curtains when the trainmen do not detach the handles from the hooks of the next cars when the cars are uncoupled. When



Self-Opening Handle for Vestibule Curtains.

the cars are separated, the curtain is drawn out to its full extent and then torn. To prevent this, H. M. Robertson, Master Mechanic at the Como shops of the Northern Pacific, at St. Paul, has designed the latching handle shown in the accompanying drawing. Its principal dimensions are the same as the standard form of handle in common use. It is clamped to the curtain rod in the same way, but, instead of being solid with the top and bottom clips, it is hinged at one end and caught at the other by a spring, which either bears against the heel of the

handle bar or catches it at the end like a door holder. This spring is stiff enough to hold the handle in place when it is put on its hook. The rolling

spring of the curtain is not strong enough to pull it out, but if left in place while the cars are being separated, the curtain when unrolled pulls the handle free, so that it straightens out as shown by the dotted lines. It then slips off the hook and the curtain rolls up in place.

#### Sleeping Cars in the Far East.

A consular report says that a Belgian sleeping car company has decided to establish a branch at Yokohama to handle business relating to the Trans-Siberian railroad, and that agencies are to be established at several other places in the Far East. It is said that the company has arranged to have its sleeping cars run on some of the express trains on the Japanese government roads.

#### An Early Pay-as-You-Enter Car.

The accompanying cut shows the type of street car running on the Eighth avenue and Central Park line, New York, in 1862.



A Pay-as-You-Enter Car of 1862.

There was no conductor, and the driver was responsible for the deposit of the passenger's fares.



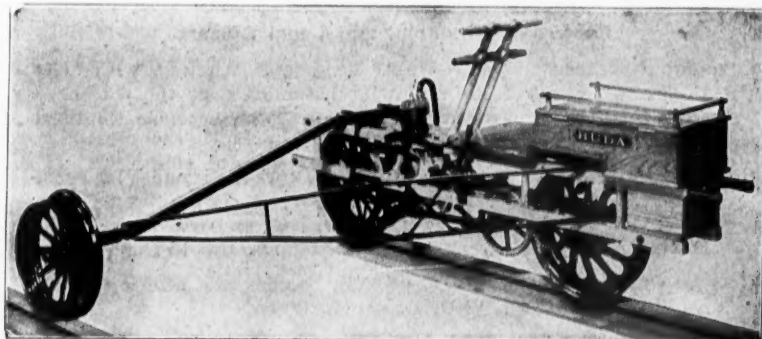
## Principal Exports of 1907.

In the *Railroad Gazette* of January 24, the 1907 exports of wheat, beef and cotton, from the principal customs districts of the United States were given. The complete figures, compiled from the returns from all ports, are somewhat larger. There were 91,383,648 bushels of wheat exported valued at \$86,089,946, an increase of 45 per cent. in bushels as compared with 1906, when 62,850,984 bushels, valued at \$49,158,650, were exported. Wheat flour amounted to 15,276,506 bbls. as compared with 14,324,100 bbls. in 1906. Exports of canned beef decreased from 35,668,372 lbs. in 1906 to 22,145,993 lbs. in 1907; and of other preserved beef from 75,667,880 lbs. to 51,195,838 lbs. Cotton, unmanufactured, amounted to 4,192,054,144 lbs., which compares with 3,850,229,030 lbs. in the previous year. Exports of timber and unmanufactured wood were valued at \$16,953,047 in 1907, and \$17,471,670 in 1906. Lumber, however, increased, the values being \$41,846,231 in 1907, and \$34,598,304 in 1906. Logs and other unmanufactured wood imported, excluding pulp wood, decreased from \$4,332,144 to \$3,686,544. Imports of mahogany, however, increased from \$2,895,825 to \$3,365,727.

## New Motor Inspection Car.

A new motor inspection car is shown herewith. One of its features is a method of limiting the speed to a predetermined maximum in accordance with the regulations of a road or the desires of department officers. This is done before the motor leaves the shop. Ordinarily, however, the speed can be graduated up to 30 m.p.h.

At starting, the car is propelled by the hand lever, until the car gets a certain momentum. Then the engine is started by throwing a switch and tightening a belt by a lever. The belt connects the front wheel of the car with the engine. Explosions start in the cylinder as soon as the flywheel of the engine begins to revolve. The hand lever is then thrown out of gear and may be locked in



Buda Gasolene Inspection Car.

any position convenient for the operator as a hand grasp and foot rest.

The engine, which is 2¼-h.p., is air cooled, and has an automatic sight-feed lubricator. The air entering the carburetor is partially heated first, making the engine start more easily in damp or cold weather. Five dry cells supply ignition current. Enough gasoline is carried to run 200 miles. The wheels are pressed steel, with reinforced tread and M. C. B. flange. The main axles are ball-bearing. The car shown has three wheels, but it may be fitted with two guide wheels instead of one, if desired. The back brace on the guide wheel arm adds rigidity and strength, and, therefore, safety to the car.

The car is made by the Buda Foundry & Manufacturing Co., Chicago. It was exhibited at the recent Maintenance of Way convention.

## Exhibit of Safety Devices.

The Exposition of Safety Devices at the American Museum of Safety Devices, 231 West Thirty-ninth street, New York, is to open April 13. Among the exhibitors are the Carnegie Steel Co., Pittsburgh, Pa.; Westinghouse Air Brake Co., Pittsburgh, Pa.; American Bridge Co., New York; Union Switch & Signal Co., Swissvale, Pa.; Yale & Towne Manufacturing Co., New York, and others.

## Defects of Our Corporation Laws.

Dr. Woodrow Wilson, President of Princeton University, in an address before the Pittsburgh Traffic Club, April 3, objected to our corporation laws on the grounds that the methods of regulation are both inequitable and futile—inequitable because they impose penal-

ties upon stockholders who are, in most cases, entirely without legal blame, and futile because they do not stop the practices for which the fines and penalties are imposed. They strike at business instead of at transactions; they penalize bodies of persons instead of individuals, and they tend to accumulate discretionary power in the hands of the executive officers of the government.

## Exports of Rails.

The shipments of rails to foreign countries during the eight months ended February 29, 1908, increased 25 per cent. over those of the corresponding period of last year. The average price was \$31.84 a ton. The values of the exports were as follows:

Country.	1908.	1907.
Europe .....	\$15,330	\$12,850
British North America .....	1,055,692	806,373
Central America .....	601,267	169,017
Mexico .....	442,655	729,855
West Indies .....	493,866	532,433
South America .....	1,145,931	1,971,723
Japan .....	1,186,602	746,625
Other Asia and Oceania .....	2,135,251	600,418
British Africa .....	7,741	700
Other Africa .....	7,984	18,122
Total .....	\$7,092,319	\$5,588,125

## The Development of Schenectady.

The following is from the *Troy Times*:

An event of historical importance was the charity ball recently given at Schenectady in the new Delaware & Hudson and New York Central & Hudson River union station. This celebration commemorated the beginning of steam railroading in this country as well as the elimination of all grade crossings in Schenectady. It is now the only city in New York state without a single dangerous railroad crossing.

It was on July 28, 1830, that ground was broken at Schenectady by Mayor Stephen Van Rensselaer for the Mohawk & Hudson Railroad. The first diminutive steam train made the trip between Schenectady and Albany, 17 miles, on August 3, 1831, in one hour and 45 minutes. In 1835 the Schenectady and Utica branch was constructed and in 1843 the Schenectady and Troy branch was built. In 1853 these roads were consolidated as the New York Central Railroad.

Since that time the historic old city has continued to occupy a large place in the annals of railroad history. As the site of the largest plant of the American Locomotive Company it became known the world over for its steam locomotives. Then the General Electric Company came, and a few years ago brought out the new electric locomotive. Not long ago this company introduced an innovation in short line railroading in the gas-electric motor car.

The work of eliminating the grade crossings at Schenectady took over three years and cost nearly \$2,000,000. In excavating for the new union station and for the concrete work of the overhead crossings many old relics of pioneer railroading were brought to light. Among the finds were cedar ties of the old Utica & Schenectady road. Wooden rails, with streaks of rust along them showing that the wooden surface had been reinforced with iron plates, were found, which were used in the early days of the old Mohawk & Hudson. A number of these iron bands or strips are still preserved in the city and the old engine, the "DeWitt Clinton," and train is owned by the New York Central & Hudson River.

The new station is large and handsome and scientific. The celebration marked the first time that a new railroad station was opened with a charity ball and a public demonstration for the benefit of charitable institutions.

Still standing in Schenectady is the little, old, red brick building in which the travelers of the '30s anxiously awaited the tiny steam train from Albany. To-day the ancient building watches people waiting about the new union station for the Empire State Express and the Twentieth Century Limited, the electric engines going up to the test track above the city and the interurban trolley lines leading to the nearby cities of Troy, Watervliet, Saratoga Springs, Albany, Amsterdam and Gloversville.

## Report on Brooklyn Bridge.

Bridge Commissioner Stevenson, of New York City, has transmitted reports on the Brooklyn Bridge by C. M. Ingersoll, Chief Engineer of the department; Professor Burr, of Columbia University, and L. S. Moisseiff, who reported for the United States government on the Quebec bridge failure. Professor Burr writes that the efficient system of inspection under which the structure is maintained has resulted in replacements, the correction of misfitting members originally placed in the stiffening trusses, and the improvement

of many details, until it may now be confidently stated that the bridge has never been in as satisfactory condition of capacity to carry traffic as at present. Mr. Moisseiff likewise finds that the bridge is in as good a physical condition, if not a better one, than it ever has been since its opening. The following extract is from the report by Professor Burr.

"The heaviest Brooklyn Rapid Transit trains now running over the bridge consist of four motor cars and two trailers, the six cars loaded weighing 236 tons. This is the weight of train considered in the report of the Commission to which allusion has already been made. It was shown in that report that, with such trains moving at a maximum speed of fifteen miles per hour, with a headway of 45 seconds, and with trains separated by not less than 700 ft. between them, making a total of 80 per hour, the greatest stresses in the cables, suspenders, towers, anchorages and stiffening trusses would be 'safe and prudent,' it being the intention at that time to replace the floor system as soon as practicable, which work is now in progress. It is unnecessary to repeat here the details of this conclusion, as they will be found stated in full in the report of December 31, 1906. It is clear, therefore, that the present use of the bridge, with the Brooklyn Rapid Transit trains running in the manner described, up to a limit of 80 trains per hour, cannot be productive of any condition causing danger to the structure.

"It has been proposed to operate six loaded motor car trains, weighing 275 tons each, at the same maximum speed and with the same clear headway as with the trains consisting of four motor cars and two trailers. If this should be done, the resulting total cable stress would not be increased more than  $2\frac{1}{2}$  per cent., with other stresses throughout the structure increased in a somewhat greater percentage, but still remaining within safe limits."

#### INTERSTATE COMMERCE COMMISSION RULINGS.

##### Revised Tariff Regulations.

The Commission has issued tariff circular No. 15-A, containing the "Regulations Governing the Construction and Filing of Freight Tariffs and Classifications and Passenger Fare Schedules," as well as administrative rulings and opinions. This circular is a revision of and succeeds tariff circular No. 14-A and special circulars Nos. 1, 2, 3, 5 and 7, tariff department. It contains 90 pages of text and an 11-page index. It is effective April 15, 1908.

#### MANUFACTURING AND BUSINESS.

The offices of the Electric Welding Co., Pittsburgh, Pa., have been moved from 4 Smithfield street, to 316 Fourth avenue.

The offices of the Lehigh Valley Testing Laboratory, Pittsburgh, Pa., have been moved from 4 Smithfield street to 316 Fourth avenue.

The offices of Jacobs & Davies, Consulting Engineers, New York, will be moved on April 15 to the Hudson Terminal building, 30 Church street.

The office of Robert A. Cummings, Civil Engineer, M. Am. Soc. C. E., Pittsburgh, Pa., has been moved from 4 Smithfield street to 316 Fourth avenue.

William H. Donner has been elected Vice-President of the Westinghouse Machine Co., Pittsburgh, Pa., "in direct responsible charge of all of its activities."

All the bridges on the Guatemala Railroad, described in the *Railroad Gazette* of last week, were furnished by the Baltimore Bridge Co., Baltimore, Md.

A. E. Mitchell, heretofore Manager of Purchases and Supplies of the New York, New Haven & Hartford, has resigned to go to The Wyckoff Pipe & Creosoting Co., Stamford, Conn.

The offices of the United States Steel Products Export Co., New York, the foreign sales department of the United States Steel Corporation, will be moved on April 11 to the Hudson Terminal building, 30 Church street.

The A. Gilbert & Sons Brass Foundry Co., St. Louis, Mo., has moved into new quarters at 4015-4019 Forest Park boulevard. The new foundry is equipped with an overhead trolley system, oil furnaces, fireproof pattern vaults, etc. It has a daily capacity of 42,000 brass castings, and employs 50 men normally.

In a recent competitive test of track drills made on a large western railroad, the "Climax" drilled a hole in an 85-lb. rail, using a 1-in. flat bit at 168 r.p.m., in 2 min. 40 sec.; at 226 r.p.m., the time was 2 min. 25 sec. The drill was worked by two ordinary section men. These figures are furnished by Cook's Standard Tool Co., Kalamazoo, Mich., maker of "Climax" drills.

During the fiscal year ended February 1, 1908, the General Electric Co., Schenectady, N. Y., took orders for 325 Curtis turbines, aggregating 286,320 k.w. capacity. On December 31, 1907, there

were orders on hand for 153, and up to that date 943 machines, in all, had been installed, their aggregate capacity being 807,610 k.w. Of all the plants for which Curtis turbines had been ordered or delivered up to the end of 1907, 261 were central station and electric traction plants, averaging 3,778 k.w. capacity, and 288 were industrial and miscellaneous plants, averaging 305 k.w. capacity.

A new plan of reorganization for the Westinghouse Electric & Mfg. Co., Pittsburgh, Pa., has been prepared by the creditors' committee and approved by the directors and the original reorganization committee. Under this plan no mortgage bonds will be issued, and the stockholders are to be required to subscribe to only \$6,000,000 new stock instead of \$7,000,000. In all, \$10,000,000 stock is to be issued, of which the creditors will take \$4,000,000. Stockholders are to pay for new stock in instalments, the first due June 1, 1908, and the last, April 1, 1909. The cash accounts and bills receivable on February 29, 1908, amounted to \$12,832,729, and working assets (materials and supplies, etc.), to \$14,601,671.

#### Iron and Steel.

The Chicago, Burlington & Quincy, it is said, has ordered 900 tons of structural steel from the American Bridge Co.

The Isthmian Canal Commission has ordered 2,031 tons of rails for canal work from the R. C. Hoffman Co., Baltimore, Md.

The New South Wales Government has ordered 6,000 tons of rails from the Pennsylvania Steel Co., and it is understood that 20,000 tons more will be bought in the future.

#### OBITUARY NOTICES.

John G. Wilson, General Attorney of the Baltimore & Ohio, died on April 7 from cerebro-spinal meningitis.

#### ELECTIONS AND APPOINTMENTS.

##### Executive, Financial and Legal Officers.

*Canadian Northern Quebec.*—W. A. Kingsland, Auditor, with office at Quebec, has had his authority extended over the Quebec & Lake St. John, succeeding S. S. Oliver, who becomes Engineer of Maintenance of Way of both roads.

*Georgia & Florida.*—The offices of E. L. Bemiss, Second Vice-President; J. M. Turner, General Manager; A. Pope, Traffic Manager; W. H. Alexander, Auditor, and G. B. Hazlehurst, Chief Engineer, have been removed from Augusta, Ga., to Douglas, Ga.

*Georgia Coast & Piedmont.*—A. de Sola Mendes has been appointed Auditor, succeeding W. R. Basset, resigned.

*Illinois Central.*—B. A. Beck has been elected Assistant Secretary at Chicago, Ill., succeeding W. G. Bruen.  
See Indianapolis Southern.

*Indianapolis Southern.*—O. F. Nau, Local Treasurer at Chicago, Ill., has been elected Treasurer, succeeding E. T. H. Gibson.

*La Crosse & Southeastern.*—P. Valier, Purchasing Agent and Superintendent, has been elected Vice-President and General Manager, with office at La Crosse, Wis.

*Macon, Dublin & Savannah.*—Homer Loring, President of the Fort Dodge, Des Moines & Southern, and of the Newton & Northwestern, has been elected also President of the Macon, Dublin & Savannah, with office at Boston, Mass., succeeding W. A. Garrett, Chief Executive officer for the Receivers of the Seaboard Air Line.

*Missouri, Oklahoma & Gulf.*—E. A. Chavannes has been appointed Auditor, with office at Muskogee, Okla., succeeding R. P. Dunbar.

*National Railways of Mexico.*—Pablo Macedo, Chairman of the Mexican Senate, has been elected temporary President of this new company, representing the Mexican government.

*Oklahoma Central.*—G. H. Parker, Assistant Auditor, has been appointed Auditor, with office at Purcell, Okla., succeeding E. I. Green. The office of Assistant Auditor has been abolished.

*Panama Railroad.*—Lieut.-Col. H. F. Hodges, General Purchasing Agent of the Panama Railroad, with headquarters at Washington, D. C., has been elected a Director, succeeding Gen. Peter C. Hains, retired.

*Peoria & Pekin Union.*—George E. Dayle has been appointed Auditor, relieving President H. K. Pinkney of duties temporarily assumed by him.

*Quebec & Lake St. John.*—See Canadian Northern Quebec.

*Rio Grande, Sierra Madre & Pacific.*—C. L. Montague has been appointed Secretary of the Sierra Madre & Pacific, succeeding J.



H. Martin, who remains Secretary of the Rio Grande, Sierra Madre & Pacific. D. J. Kerr has been appointed Auditor of the Sierra Madre & Pacific, succeeding W. Maurer, who remains Auditor of the Rio Grande, Sierra Madre & Pacific, both with offices at Madera, Chihuahua, Mex.

*San Pete Valley.*—J. W. Gilluly has been elected Treasurer, with office at Denver, Colo., succeeding E. A. Greenwood.

*Seaboard Air Line.*—See Macon, Dublin & Savannah.

*Sierra Madre & Pacific.*—See Rio Grande, Sierra Madre & Pacific.

*Tampa Northern.*—A. G. Brewer has been appointed to the new office of Auditor, with headquarters at Tampa, Fla.

*Tonopah & Goldfield.*—J. W. Reinhart has been appointed Assistant to the President, and Comptroller, with office at Tonopah, Nev. Mr. Reinhart will have direct control of the finances and accounts and will exercise executive powers over all departments, including operating and traffic, in the absence of the President.

*Williamson, Greenville & St. Louis.*—The officers of this company are now as follows: D. H. Glass, President; H. B. Montgomery, Vice-President; W. P. Druick, Secretary and Treasurer; C. A. Long, General Manager; G. A. Long, General Superintendent, and H. H. Rhodes, Auditor, all with offices at Greenville, Mo.

#### Operating Officers.

*Ann Arbor.*—K. A. Gohring has been appointed Superintendent, with office at Owosso, Mich., succeeding E. Hartenstein.

*Arkansas Midland.*—H. J. Schueing has been appointed Superintendent, with office at Wynn, Ark., succeeding J. F. Murphy.

*Buffalo & Susquehanna.*—G. H. Crissman has been appointed Assistant Superintendent, with office at DuBois, Pa. Mr. Crissman has direct charge of the despatcher's office at DuBois, the office of chief despatcher at that place having been abolished.

*Canadian Northern Quebec.*—John F. Spaidall, General Superintendent, with headquarters at Montreal, Que., has had his authority extended over the Quebec & Lake St. John and his office changed to Quebec.

*Charlotte Harbor & Northern.*—E. G. Bagwell has been appointed Superintendent, with office at Hull, Fla., succeeding C. B. McCall.

*Chattahoochee Valley.*—J. A. Avery is now General Manager as well as Traffic Manager of this road, with headquarters at West Point, Ga.

*Chicago, Burlington & Quincy.*—The appointments mentioned in the *Railroad Gazette* of March 27, in connection with the promotion of F. S. Ustick, Superintendent at Aurora, Ill., have not been made, owing to a change in plans. A. V. Brown remains Superintendent at Ottumwa, Iowa, and A. W. Newton, who has been General Inspector of Permanent Way and Structures, remains on the staff of the Second Vice-President, with headquarters at Chicago, Ill.

*Cincinnati, New Orleans & Texas Pacific.*—The office of Car Accountant has been abolished.

The office of W. S. Milton, Superintendent of Telegraph, has been removed from Chattanooga, Tenn., to Lexington, Ky.

*Detroit, Toledo & Ironton.*—H. E. Warner, Trainmaster at Springfield, Ohio, has been appointed Superintendent, with office at the same place.

*Great Northern.*—S. A. Walker, Superintendent at Havre, Mont., has been appointed Assistant Superintendent of the Willmar division, with office at Willmar, Minn., succeeding F. S. Elliott.

*Illinois Central.*—H. Battisford, Superintendent of Freight Terminals at Chicago, Ill., has been appointed Superintendent of the Chicago division, with office at Chicago, succeeding J. C. Dailey, now on the International & Great Northern. The title of H. P. Thrall has been changed from Superintendent of Mail Service to Mail Traffic Manager. Mr. Thrall also has the same position on the Indianapolis Southern.

P. Laden, Superintendent of the Peoria division, with headquarters at Mattoon, Ill., has had his authority extended over the Indianapolis Southern, succeeding L. W. Baldwin. Mr. Baldwin has been appointed Trainmaster of the Indianapolis Southern, with office at Indianapolis, Ind., succeeding R. A. Brown, appointed chief despatcher of that road, with office at Indianapolis, Ind.

*Indianapolis Southern.*—See Illinois Central.

*Mexican Central.*—D. F. Bucher, General Superintendent, has been appointed Car Service Superintendent, succeeding H. Putnam, who becomes Chief of Train Auditors, reporting to the General Manager. The office of Fuel Agent has been abolished, all reports being made direct to the General Manager.

Under the new divisional organization which went in effect April 1, Division Superintendents have charge of and are responsible for the discipline of all employees on their divisions, including those in the track department and the mechanical department, and all other employees except those directly under the traffic department. The employment of all forces on each division, increase or decrease in the number of men employed and all matters of discipline are handled by the Superintendents who are responsible to the General Manager in all such matters.

The El Pazo-Ciudad Juarez terminal is entirely in the charge of the Terminal Superintendent, reporting to the Superintendent of the Chihuahua division. The city ticket agent, station agent, customs agent, foreman, yardmaster, etc., report direct to the Terminal Superintendent. This does not, however, interfere with instructions that may be issued by the general freight department, general passenger department or auditing department in regard to freight or passenger rates or accounts. See Engineering and Rolling Stock officers.

*Minneapolis & St. Louis.*—H. G. Kruse, formerly Superintendent of the Peoria & Pekin Union, at Peoria, Ill., has been appointed Trainmaster of the Southern Des Moines division and of the Southwestern division of the Minneapolis & St. Louis, with office at Fort Dodge, Iowa, succeeding T. G. Hyland, resigned.

*Quebec & Lake St. John.*—See Canadian Northern Quebec.

*Saratoga & Encampment.*—B. F. Dunn, formerly division passenger agent of the St. Louis & San Francisco, at Wichita, Kan., and later Assistant to the Vice-President and General Manager of the Denver, Enid & Gulf, at Enid, Okla., has been appointed General Superintendent, with office at Saratoga, Wyo., succeeding LeGrand Young, Jr., resigned to go to another company.

*Seaboard Air Line.*—R. E. Boswell, Superintendent of Transportation at Portsmouth, Va., has been appointed Superintendent of the Sixth division, with office at Jacksonville, Fla., succeeding W. J. Jenks. H. W. Stanley, Assistant General Superintendent at Portsmouth, succeeds Mr. Boswell.

*Tampa & Jacksonville.*—A. L. Glass has been appointed General Superintendent, with office at Gainesville, Fla., succeeding J. B. Cutler, resigned.

*Tennessee & North Carolina.*—A. J. McMahon has been appointed Superintendent and Auditor, with office at Newport, Tenn., succeeding P. T. Bauman.

#### Traffic Officers.

*Atchison, Topeka & Santa Fe.*—H. B. Gregory, Acting General Agent at Santa Barbara, Cal., has been appointed General Agent at that place.

*Beaumont & Great Northern.*—G. R. Wansborough has been appointed General Freight and Passenger Agent, with office at Onalaska, Tex.

*Canadian Northern Quebec.*—Guy Tombs, General Freight and Passenger Agent of the Canadian Northern Quebec, with headquarters at Montreal, Quebec, has had his authority extended over the Quebec & Lake St. John, succeeding A. Hardy.

*Central Vermont.*—See Grand Trunk.

*Chattahoochee Valley.*—See under Operating Officers.

*Colorado & Southern.*—See Colorado Springs & Cripple Creek District.

*Colorado Springs & Cripple Creek District.*—F. C. Matthews has been appointed General Freight and Passenger Agent of the Colorado Springs & Cripple Creek District Railway, the Florence & Cripple Creek and the Midland Terminal, with office at Colorado Springs, Colo.

*Florence & Cripple Creek.*—See Colorado Springs & Cripple Creek District.

*Grand Trunk.*—Robert L. Burnap, General Freight Agent of the Central Vermont, has been appointed Assistant General Freight Agent of the Grand Trunk, with headquarters at Chicago, Ill., succeeding C. A. Hayes.

*Maine Central.*—The office of Fred V. Berry, Assistant General Passenger and Freight Agent of the Somerset Railway, has been abolished, and Mr. Berry has been assigned to special service in the general office of the Maine Central at Portland, Me.

*Midland Terminal.*—See Colorado Springs & Cripple Creek District.

*Philadelphia & Reading.*—B. H. Bail, General Freight Agent, has been appointed Freight Traffic Manager, a new office, with headquarters at Philadelphia, Pa.

*Quebec & Lake St. John.*—See Canadian Northern Quebec.

*Rio Grande, Sierra Madre & Pacific.*—W. T. O'Donnell has been appointed General Freight and Passenger Agent of the Sierra

Madre & Pacific, with office at Madera, Chihuahua, Mex., succeeding B. F. Seggerson, who remains General Freight and Passenger Agent of the Rio Grande, Sierra Madre & Pacific.

*Sierra Madre & Pacific.*—See Rio Grande, Sierra Madre & Pacific.

*Somerset Railway.*—See Maine Central.

#### Engineering and Rolling Stock Officers.

*Ann Arbor.*—See Detroit, Toledo & Ironton.

*Canadian Northern Quebec.*—A. E. Doucet, Chief Engineer of the Quebec & Lake St. John, has resigned to give his whole time to his work as District Engineer of the National Transcontinental Railway Commission, with headquarters at Quebec.

S. S. Oliver, Auditor of the Quebec & Lake St. John, has been appointed Engineer of Maintenance of Way of the Canadian Northern Quebec and the Quebec & Lake St. John.

*Cincinnati, New Orleans & Texas Pacific.*—The office of C. Dougherty, Assistant Chief Engineer at Cincinnati, Ohio, has been abolished.

*Detroit, Toledo & Ironton.*—The office of R. Tawse, Superintendent of Motive Power of the Detroit, Toledo & Ironton of the Ann Arbor, has been moved from Jackson, Ohio, to Toledo.

*Idaho & Washington Northern.*—W. C. Smith has been appointed Chief Engineer, with office at Coeur D'Alene, Idaho, succeeding L. F. McCoy, resigned.

W. J. Spearman has been appointed to the new office of Master Mechanic, with office at Coeur D'Alene, Idaho.

*Mexican Central.*—Under the new divisional organization which went in effect April 1, the authority of Ben Johnson, Superintendent of Machinery, is outlined as follows:

The Superintendent of Machinery will instruct the Master Mechanics in regard to methods of handling work in the mechanical department, will advise them fully from time to time of all standards adopted, and will see that these standards are followed. In order to preserve uniformity, the Superintendent of Machinery will have, through the Superintendents, general supervision over the wages paid in the different shops and to other employees in the mechanical department. He will also have charge of and be responsible for the stock of material carried on hand for the mechanical department, and will keep up the supply by requisition or by deliveries from the general store at Aguascalientes, as his judgment may dictate. The general shops at Aguascalientes and everything pertaining thereto within the shop walls, including the tie treating plant, will be under the direct charge of the Superintendent of Machinery. See Operating Officers.

*National Transcontinental Railway Commission.*—See Canadian Northern Quebec.

*New York Central & Hudson River.*—D. R. MacBain, Assistant Superintendent of Motive Power of the Michigan Central, at Detroit, Mich., has been appointed Assistant Superintendent of Motive Power of the New York Central & Hudson River, with headquarters at Albany, N. Y.

*Quebec & Lake St. John.*—See Canadian Northern Quebec.

*Tehuantepec National.*—Ernest H. Mitchell has been appointed Acting Chief Engineer, with office at Rincon Antonio, Oaxaca, succeeding D. Coe, Chief Engineer.

#### Purchasing Agents.

*Algoma Central & Hudson Bay.*—T. H. McGillivray has been appointed Purchasing Agent, succeeding W. H. Cowell.

*New York, New Haven & Hartford.*—The title of J. H. Sanford is Purchasing Agent. As previously announced, he succeeded to the duties of A. E. Mitchell, Manager of Purchases and Supplies, which title has been abolished.

#### LOCOMOTIVE BUILDING.

The Idaho & Washington Northern has ordered one 75-ton ten-wheel passenger locomotive, cylinders 19 in. x 26 in., from the Baldwin Locomotive Works. It will be a duplicate of two of those ordered last spring.

The New York Central Lines, as noted in the *Railroad Gazette* of March 27, have ordered from the American Locomotive Co. 12 electric locomotives, 20 Pacific, 22 in. x 28 in., 45 consolidation, 23 in. x 32 in., and 29 six-wheel switch engines, 21 in. x 28 in., for the N. Y. C. & H. R., and 12 Pacific, 20 consolidation and 10 six-wheel switch engines for the B. & A. These locomotives will be similar to those of the same types previously built.

The H. K. Porter Co. has the following recent orders: Winston-Dear Co., four 3-ft. gage contractors' locomotives, 11 in. x 16 in.; Pennsylvania Salt Manufacturing Co., two standard gage switch engines, one of which will have cylinders 14 in. x 20 in., and the

other 16 in. x 24 in.; O'Brien & Mullarkey, Montreal, Canada, one 3-ft. gage contractors' locomotive, cylinders 9 in. x 14 in.; Cummer Lumber Co., Newberry, Fla., one 3-ft. gage, four-driver saddle tank locomotive, 8 in. x 14 in.; Dugas & LeBlanc, Louisiana, one Forney locomotive for plantation service, cylinders 7 in. x 12 in.

#### CAR BUILDING.

An Argentine road has ordered 125 or more cars from the Middletown Car Works.

The Pennsylvania has ordered 200 all-steel class GLA gondolas from the Middletown Car Works.

The Idaho & Washington Northern has ordered 12 wooden frame refrigerator cars, 36 ft. 6 in. long, from Haskell & Barker.

The Mexican Central has ordered eight combination passenger and two combination baggage and express cars from the American Car & Foundry Co.

#### RAILROAD STRUCTURES.

BEAVER, PA.—The Pittsburgh & Lake Erie, it is said, has started work on the proposed steel bridge over the Ohio river at the mouth of Beaver river. The plans call for a two-track structure instead of a three-track, reducing the amount of steel needed from 18,000 tons to 14,000 tons, contract for which has not yet been let. The bridge is to have a total length of 1,787 ft., and will cost, with the necessary changes in the tracks and approaches, about \$2,000,000. Some of the work is reported let to the Dravo Construction Co., of Pittsburgh, Pa. The value of the contract is said to be about \$500,000. (Jan. 24, p. 136.)

CALGARY, ALB.—The Canadian Pacific, according to reports, will this summer replace many of the wooden bridges on its main line between this place and Vancouver, B. C., with steel structures.

COEUR D'ALENE, IDAHO.—The Idaho & Washington Northern is building brick passenger stations 28 ft. x 70 ft. at Rathdrum, Idaho, and at Newport, Wash.

CULIACAN, MEXICO.—Work on the Southern Pacific's extension down the Pacific coast to Mexico involves the construction of 22 large bridges. Work is now under way on several of these structures. One of the largest is now being built over the Culican river, at Culiacan. It is to be steel, 1,500 ft. long.

KENORA, ONT.—Contract is reported let to Kelly Bros., of this place, to build 17 bridges on the section of the Grand Trunk Pacific from a point east of Winnipeg, east to the junction with the Lake Superior branch, under contract to J. D. MacArthur. Grant & MacDonald, it is said, have been given contracts for several bridges on the section from Saskatoon to Edmonton, under contract to Foley, Welch & Stewart.

NEW YORK, N. Y.—The Board of Aldermen has just appropriated \$1,200,000 for paving the roadway, flooring the footpaths, placing tops on the towers, laying tracks and painting the Blackwell's Island bridge. It is thought that this will be sufficient to finish the construction of the superstructure.

The new subway terminal of the Williamsburg bridge, at Delancey street, Manhattan, has been finished. There are eight loops in the street terminal, separated by partitions, each with individual entrance and exit from the street.

SOUTH NORWALK, CONN.—The freight house of the New York, New Haven & Hartford here was destroyed by fire April 5, also 30 cars standing on the siding. The loss is estimated at \$100,000.

WINNIPEG, MAN.—J. S. MacArthur, it is said, will sublet the contract for the large steel bridge over the Red river here. Soundings have been finished and the location definitely decided on. It is to run from the foot of Lombard street to St. Boniface. Work is to be started at once.

#### RAILROAD CONSTRUCTION.

##### New Incorporations, Surveys, Etc.

BIENVILLE & QUITMAN.—An officer reports that contracts have been given by this company to Richardson-Taylor Lumber Company for work on the line it is building from Bienville, La., east to Quitman, 12 miles. Track has been laid on about two miles. D. C. Richardson, President, Shreveport, La.; E. E. Scott, Chief Engineer, Bienville, La. (Mar. 27, p. 461.)

COPPER RIVER & NORTHWESTERN.—According to reports from Seattle, Wash., about 1,500 men are to be put at work by M. J. Heeney, the contractor who is building this line from Catalla, Alaska, through Copper River valley to the interior of Alaska. (Mar. 13, p. 390.)

CHICAGO & MILWAUKEE ELECTRIC.—This company, building an



electric line from Chicago, Ill., north to Milwaukee, Wis., for which contracts have been let to the MacArthur Bros. Co. and the Republic Construction Co., has received authority to issue receiver's certificates on the Wisconsin division to continue the line to Milwaukee, so that through trains from Evanston, Ill., can be put in operation by June. Two miles of track out of the  $3\frac{1}{2}$  to be built in the city of Milwaukee have been finished; track is also laid to a point 12 miles north of Racine, and grading is finished on eight miles additional. (Mar. 13, p. 390.)

**GRAND TRUNK.**—Surveys reported under way for a new double-track line from Midland, Ont., east to Port Hope. The proposed line is to be built north of the present line, with easy grades, to haul grain from the company's elevator at Midland, which has a capacity of 2,000,000 bushels.

**GREAT WESTERN.**—This company has finished an extension from Liberty, Colo., southwest to Longmont, six miles.

**IDAHO NORTHERN RAILROAD.**—This company, which was organized to build 76 miles of line in the Coeur d'Alene district, Idaho, has work under way from Enaville on the Wallace-Tekoa branch of the Oregon Railroad & Navigation Company, near Kingston, Idaho, northeast to a point six miles east of Murray, 33 miles, of which about one-fifth is finished. This section is expected to be ready for operation this year. Branches aggregating 43 miles are to be built. B. F. O'Neil, President of the State Bank of Commerce, at Wallace, is President, and E. P. Spalding, 416 Lindell Block, Spokane, Wash., is Vice-President and General Manager. This company has no connection with the Idaho Northern Railway, operating 59 miles of railroad in Idaho.

**KENTUCKY & OHIO RIVER INTERURBAN.**—An agreement, it is said, has been made by this company with the Royal Investment Company, of Minneapolis, Minn., to build 50 miles of electric line to connect Cairo, Ill., with Paducah, Ky.

**MISSOURI & NORTH ARKANSAS.**—This road has been extended from Seligman, Mo., northwest to Neosho, Mo., 41 miles (Mar. 13, p. 392.)

**NEVADA NORTHERN.**—This company has opened a new line from McGill Junction, Nev., to McGill, three miles.

**OKLAHOMA CENTRAL.**—This company has extended the operation of trains on its road from Blanchard, Okla., west to Chickasha, 22 miles. (Nov. 8, p. 573.)

**PITTSBURGH, SHAWMUT & NORTHERN.**—This company has finished the line between Brockwayville, Pa., and Brookville, 18.9 miles, and trains are now in operation between St. Marys and Ramsaytown.

**SPOKANE, PORTLAND & SEATTLE.**—This company's line from Pasco, Wash., west to Vancouver, 221 miles, was opened for freight and passenger traffic on March 16. At Vancouver connection is made for passengers with the Portland Railway, Light & Power Company's electric line to Portland. A bridge is being built across the Columbia river at Vancouver, and the road is to be extended over this to Portland.

#### RAILROAD CORPORATION NEWS.

**BUFFALO, ROCHESTER & PITTSBURGH.**—Gross earnings for the last week in March, 1908, were \$206,000 against \$210,000 in the corresponding period of 1907, a decrease of \$4,000.

**CANADIAN PACIFIC.**—This company is reported to have recently sold 20,000 acres of irrigated land to settlers at \$17.50 an acre, and 15,000 acres at \$37.50 an acre, a total of \$912,500 recently received from sale of irrigated lands.

**CAROLINA, CLINCHFIELD & OHIO.**—This company, formerly the South & Western, is to make a mortgage covering \$15,000,000 5 per cent. 30-year first mortgage bonds dated January 1, 1908, of which \$3,000,000 will be reserved to retire the bonds of three constituent railroads, and another \$3,000,000 reserved for equipment. The rest of the issue will be used in paying the cost of construction of the line. (Mar. 20, 1908, p. 430.)

**CHESAPEAKE & OHIO.**—Gross earnings for February, 1908, were \$1,576,000, against \$1,931,000 in 1907. Net earnings were \$446,000, against \$582,000 in 1907. The operating ratio was 71.7 per cent., against 69.9 per cent. in 1907.

**CHICAGO & MILWAUKEE ELECTRIC.**—The receivers have been authorized by Judge Grosscup of the United States Court, of Chicago, to issue \$900,000 receiver's certificates covering the amount necessary to finish the line into Milwaukee. These certificates will be issued by the Chicago & Milwaukee Electric Railroad of Wisconsin and will be a prior lien to all the other securities of that company. They will not be a prior lien, however, to the securities of the Chicago & Milwaukee Electric Railroad of Illinois, which is the controlling company.

**CHICAGO CITY RAILWAY.**—E. H. Rollins & Sons, of Boston, Chicago, Denver and San Francisco, have offered at 96½, yielding about 5.3 per cent., \$1,000,000 first mortgage 5 per cent. bonds due 1927, of the Chicago City Railway. These bonds are a first mortgage on 244 miles of track, covering the south side of the city of Chicago.

**CHICAGO, ROCK ISLAND & PACIFIC.**—Gross earnings for February were \$4,270,000 against \$4,630,000 in 1907, a decrease of \$360,000. Net earnings were \$670,000 against \$1,200,000 in 1907, a decrease of \$530,000. See Rock Island Company.

**CINCINNATI, HAMILTON & DAYTON.**—The bondholders' committee announces that on April 2, 1908, over 74 per cent. of the holders of the 4 per cent. refunding mortgage bonds of 1954 had exchanged their bonds for the new 5½-year collateral trust 4 per cent. notes dated January 1, 1908. These notes are secured by the refunding mortgage bonds for which they are exchanged. (Jan. 10, 1908, p. 74; Mar. 27, 1908, p. 462.)

**DELAWARE & HUDSON.**—The New York Public Service Commission, Second District, has granted the application of this company for authority to acquire the one outstanding share of the New York & Canada Railroad, not already owned by it. (April 3, 1908, p. 493.)

Gross railroad earnings for February were \$1,340,000, against \$1,270,000 in 1907, an increase of \$70,000. Net railroad earnings after taxes were \$449,000 against \$427,000 in 1907, an increase of \$22,000. The January gross and net earnings increased at about the same rate.

**ERIE.**—At a meeting of the directors, held April 4, 1908, the following plan was adopted for meeting the \$5,500,000 discount notes which fell due on April 8. The \$15,000,000 three-year collateral notes authorized March 31, 1908, by the Public Service Commission, Second District (April 3, 1908, p. 494), were to be issued for the following purposes:

First, \$5,500,000 to be exchanged at par for the same amount of discount notes.

Second, Not less than \$5,000,000 to be sold at par for cash on condition that all of the \$5,500,000 unsecured notes shall have been exchanged for the new notes.

Third, Not more than \$4,500,000 to be reserved for future issue, according to the judgment of a committee, consisting of Charles Steele, George F. Baker and E. H. Harriman.

These new notes are secured by:

General lien 4 per cent. bonds .....	\$9,457,000
Convertible 50-year 4 per cent. bonds, Series B. ....	985,000
Mutual Terminal Co. of Buffalo, N. Y., first mortgage, 4 per cent., 20-year bonds .....	625,000
Erie Railroad, Pennsylvania collateral 4 per cent. bonds...	336,000
Hocking Valley common stock .....	1,154,000
Temple Iron Co. stock .....	145,700
Lehigh & Hudson River stock .....	134,000
Total, par value .....	\$12,836,700

On April 8 considerable amounts of the discount notes were presented for payment, their holders refusing to exchange them for the new notes. During the day it became evident that the plan outlined above could not succeed. Toward the end of the day an offer was made by E. H. Harriman to buy not more than \$5,500,000 of the new 6 per cent. collateral notes at 95 to the extent required for providing funds for payment of the discount notes. Holders of the discount notes now may receive cash for their notes or, until April 15, the same amount of the new 6 per cent. collateral notes and 5 per cent. in cash.

**HOCKING VALLEY.**—For stock of this company pledged as collateral, see Erie.

**INTERCOLONIAL.**—The legislature of Nova Scotia has passed a resolution calling on the government of Canada to acquire all the railroad lines in that province and turn them over to the Intercolonial Railway.

**LEHIGH & HUDSON RIVER.**—For stock of this company pledged as collateral, see Erie.

**LOUISVILLE & NASHVILLE.**—Gross earnings for the eight months ended February 29, 1908, were \$31,115,000, against \$31,519,000 in 1907, a decrease of \$404,000. Operating expenses increased from \$21,346,000 to \$23,639,000, a rise of \$2,293,000. Net earnings after taxes were \$6,560,000, against \$9,357,000 in the eight months ended February 28 1908. The operating ratio was 75.98 per cent., against 67.72 per cent. in the earlier year.

**MACON, DUBLIN & SAVANNAH.**—W. A. Garrett, President of the Seaboard Air Line, has been succeeded as President of the Macon, Dublin & Savannah by Homer Loring, of Boston, Mass., President of the Fort Dodge, Des Moines & Southern, and of the Newton & Northwestern.

**METROPOLITAN STREET RAILWAY.**—See New York City Railway.

**MEXICAN CENTRAL.**—See National Railways of Mexico.

**MINNEAPOLIS, ST. PAUL & SAULT STE. MARIE.**—Gross earnings for February were \$680,000, against \$702,000 in February, 1907, while operating expenses were \$512,000, against \$579,000 in 1907, leaving net earnings of \$168,000, against \$124,000 in 1907. The month of February, 1907, was one of exceedingly severe winter weather in the territory of this road, as may be seen from the fact that maintenance of way and structures cost \$127,000 in that month, as against \$73,000 in February, 1908.

**MISSOURI & NORTH ARKANSAS.**—Francis Bro. & Co., of St. Louis, have offered at par, yielding 6 per cent., \$300,000, and the Mercantile Trust Co., of St. Louis, on the same terms, \$600,000 of the 6 per cent. "John Scullin collateral trust" 3½-year notes dated April 1, 1908. These two blocks comprise the total issue of these notes, which are secured by \$1,123,000 5 per cent. collateral trust notes due October 1, 1911, of the Allegheny Improvement Co. This is a construction company which has the contract to build 211 miles of extensions of the Missouri & North Arkansas. The notes of the improvement company are secured by the securities of the 122 miles of the Missouri & North Arkansas now in operation. The bankers state that they have absolute confidence and belief in the ability of Mr. Scullin to pay these notes at maturity.

**NATIONAL OF MEXICO.**—See National Railways of Mexico.

**NATIONAL RAILWAYS OF MEXICO.**—The terms of exchange of securities of the Mexican Central and the National of Mexico for securities of this new company which is to take over these two roads, were announced on April 8, 1908. The securities of the National Railways of Mexico are as announced in this column on July 12, 1907, page 54, as follows:

Prior lien, 4½ per cent. bonds.....	*\$225,000,000
General mortgage 4 per cent. bonds, guaranteed by the Republic of Mexico.....	†160,000,000
Non-cumulative, 4 per cent., first preferred stock.....	30,000,000
Non-cumulative 5 per cent., second preferred stock.....	125,000,000
Common stock.....	75,000,000
<b>Total.....</b>	<b>\$615,000,000</b>

\*\$6,000,000 additional may be issued in exchange for \$6,000,000 (\$1,200,000) prior lien bonds of the Mexican International, or an equal amount of prior lien bonds of the National of Mexico, into which these may have been refunded.

†Additional bonds may be issued to refund an equal amount of consolidated mortgage bonds of the Mexican International or of consolidated mortgage bonds of the National of Mexico, into which these may have been refunded. Also to refund an equal amount of consolidated mortgage bonds of the National of Mexico into which prior lien bonds of that company may have been refunded.

No arrangements have yet been made for exchange of the following securities for payment of both principal and interest of which, however, the new company is to become liable:

**National of Mexico:**

Prior lien 4½ per cent. bonds.  
First consolidated mortgage 4 per cent. mortgage bonds.  
5 per cent. (extended) gold notes.

**Mexican Central:**

4-year 5 per cent. gold notes.

The basis of exchange of the other securities of the two companies to be merged is as follows:

**National of Mexico. Stock per \$100 share.**

First preferred stock...\$100 new 1st pref. stock and \$10 cash.  
Second "..."\$110 new 2d pref. stock.  
Common stock (old)...\$73½ new 2d pref. stock and \$33½ new com. stock.  
Deferred stock.....\$100 new common stock.

**Mexican Central. Bonds, per \$1,000.**

Priority 5 per cent....\$700 new 4½ per cent. prior lien bonds and \$475 new 4 per cent. general mortgage bonds.

First mort. 7 per cent. bonds and scrip...\$1,000 4½ per cent. prior lien bonds.

Consolidated mortgage 4 per cent. bonds...\$600 4½ per cent. prior lien bonds, \$325 4 per cent. general mortgage bonds and \$75 new second preferred stock.

Reg. income bonds and scrip.....\$1,100 new second preferred stock.  
2d cons. income bonds...\$1,000 new second preferred stock.  
Stock (\$100 shares)...\$100 new second preferred stock.

\*Assented.

The cash requirements of the consolidation plan, including the \$3,200,000 to be paid on the first preferred stock of the National of Mexico as exchanged, the payment of floating debt amounting to about \$5,500,000, the compensation of the bankers, and the provision of new working capital, are to be met by the purchase by the bankers of \$10,000,000 prior lien 4½ per cent. bonds and \$6,750,000 guaranteed general mortgage 4 per cent. bonds. The "readjustment managers" are: Kuhn, Loeb & Co.; Ladenburg, Thalmann & Co.; Hallgarten & Co., and Speyer & Co., of New York; Speyer Bros., of London; the Bank fur Handel und Industrie and the Berliner Handelsgesellschaft, of Berlin.

**NEW YORK CITY RAILWAY.**—The receivers of the Metropolitan Street Railway have announced that not including the dividends or interest on securities of the Third Avenue Railroad which is now being separated from the Metropolitan Street Railway, nor the guaranteed dividends on Metropolitan Street Railway stock, nor the interest on the general mortgage and collateral trust

5 per cent. bonds and the refunding mortgage 4 per cent. bonds now in default, nor expenses charged to construction, but only operating expenses, taxes, dividends, rentals and the interest on securities of lesser companies other than the Third Avenue, there will be a deficit of about \$1,000,000 for the year ended June 30, 1908.

The Metropolitan Street Railway was on March 31 authorized by Judge Lacombe in the United States Circuit Court to discontinue transfers between its lines and the lines of the Third Avenue Railroad and its subsidiary companies on 10 days' notice, except in certain places, where the lines are used in common for over 1,000 ft.

**NEW YORK CENTRAL LINES.**—The following table has been made by the *Wall Street Journal* from the annual reports of the five companies mentioned, showing the value of equipment received by each company through the sale in January of \$30,000,000 fifteen-year 5 per cent. equipment notes. In each case 10 per cent. of the total value of the equipment is to be paid in cash.

	Principal of certificates.	To be paid in cash.	Total value of equipment.
New York Central.....	\$12,150,000	\$1,350,000	\$13,500,000
Lake Shore.....	6,750,000	750,000	7,500,000
Michigan Central.....	3,780,000	420,000	4,200,000
Cleve., Cin., Chic. & St. L....	3,510,000	390,000	3,900,000
Chicago, Ind. & Southern....	3,780,000	420,000	4,200,000
<b>Totals.....</b>	<b>\$29,970,000</b>	<b>\$3,330,000</b>	<b>\$33,300,000</b>

A list of equipment covered by these certificates was published in this column on January 24, 1908, page 138.

The earnings for February of the four most important of the New York Central Lines are shown below. For purposes of comparison with the previous year these figures are compiled on the same basis as heretofore, and differ from those reported to the Interstate Commerce Commission under the new methods of accounting.

New York Central & Hudson River.		1908.		Change	
Gross earnings.....		\$6,045,538	Dec.	\$516,575	
Expenses.....		5,199,766	"	374,907	
<b>Net earnings.....</b>		<b>\$845,771</b>	<b>Dec.</b>	<b>\$141,669</b>	
Lake Shore & Michigan Southern.		1908.		Change	
Gross earnings.....		\$2,934,982	Dec.	\$328,846	
Expenses.....		2,065,306	"	288,221	
<b>Net earnings.....</b>		<b>\$869,676</b>	<b>Dec.</b>	<b>\$40,625</b>	
Michigan Central.		1908.		Change	
Gross earnings.....		\$1,786,391	Dec.	\$302,597	
Expenses.....		1,523,623	"	142,003	
<b>Net earnings.....</b>		<b>\$262,768</b>	<b>Dec.</b>	<b>\$160,593</b>	
Cleveland, Cincinnati, Chicago & St. Louis.		1908.		Change	
Gross earnings.....		\$1,773,771	Dec.	\$47,480	
Expenses.....		1,547,623	Inc.	112,958	
<b>Net earnings.....</b>		<b>\$226,148</b>	<b>Dec.</b>	<b>\$160,438</b>	

**NEW YORK, ONTARIO & WESTERN.**—Gross earnings for February were \$515,000, against \$519,000 in 1907. Net earnings were \$72,000, against \$104,000 in 1907. There was an increase of \$12,000 in net charges, leaving a deficit of \$14,000 against a surplus of \$30,000 in February, 1907. The operating ratio, including taxes in operating expenses, was 86 per cent., against 80 per cent in 1907.

**NORFOLK & WESTERN.**—Gross earnings for February, 1908, were \$1,818,000, against \$2,439,000 in 1907, a decrease of \$620,000. Operating expenses decreased from \$1,570,000 to \$1,193,000, a saving of \$377,000. Net earnings were \$625,000, against \$868,000 in February, 1907, a decrease of \$243,000. The operating ratio was 66 per cent., against 64 per cent. in 1907.

**ROCK ISLAND COMPANY.**—Gross earnings for February of all lines, including the Chicago, Rock Island & Pacific, the St. Louis & San Francisco, the Chicago & Eastern Illinois and the Evansville & Terre Haute, were \$7,910,000 against \$8,860,000 in 1907, a decrease of \$950,000. Operating expenses and taxes decreased \$189,000 so that net earnings were \$1,745,000 against \$2,504,000 in 1907, a decrease of \$759,000. For the eight months ended February 29, 1908, gross earnings were \$75,976,000 against \$73,456,000 in 1907, an increase of \$2,520,000, and net earnings \$19,660,000 against \$24,000,000 in 1907, a decrease of \$4,340,000.

**SEABOARD AIR LINE.**—See Macon, Dublin & Savannah.

**SOUTHERN PACIFIC.**—Gross earnings for February were \$8,475,000, against \$10,133,000 in 1907. Net earnings after taxes were \$1,842,000, against \$3,289,000 in 1907.

**TEXAS & PACIFIC.**—Gross earnings for the first three months of 1908 were \$3,460,000, against \$4,460,000 for the corresponding month of 1907, a decrease of \$1,000,000.

**THIRD AVENUE RAILROAD.**—See New York City Railway.

**TOLEDO & INDIANA (ELECTRIC).**—C. F. M. Niles has been appointed receiver of this company, the January 1 interest on whose \$1,650,000 first mortgage 5 per cent. bonds is in default. The road runs from Toledo, Ohio, west to Bryan, 55 miles. An extension and a branch have been under construction.